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December 23, 2005

Ms. Pamela J. Langston-Scully Remedial Project Manager United States Environmental Protection Agency Atlanta Federal Center 61 Forsyth Street, S.W. Atlanta, GA 30303-3104

Re: Anniston PCB Site

Revision 1 of the Screening Level Ecological Risk Assessment for Operable Units 1, 2, and 3

Dear Ms. Langston-Scully:

On behalf of Solutia Inc. and Pharmacia Corporation, as parties to the Partial Consent Decree (CD) for the Anniston PCB Site, enclosed please find eight hard copies and ten electronic copies of the revised Screening Level Ecological Risk Assessment for Operable Units 1, 2, and 3 of the Anniston PCB Site. The revisions have been made to reflect approval of the revised procedures for the biological surveys provided by Marc Greenberg on June 8, 2005 in response to comments previously provided by the United States Environmental Protection Agency (USEPA) on March 7, 2005, the use of biological indices to evaluate the biological survey data as discussed during our August 30, 2005 meeting and subsequent telephone communications between Messrs. Greenberg and Ludwig, and clarifications to the Data Quality Objectives and Preliminary Remedial Action Objectives for the Site as described in a letter from the USEPA dated August 19, 2005.

This revised report is submitted in accordance with the CD, including Section IX of the Agreement for the Remedial Investigation/Feasibility Study (Appendix A to the CD) and the Statement of Work (Appendix B to the CD).

Should you have any questions regarding this matter, please contact me at (256) 231-8404.

Sincerely,

Craig R. Branchfield

Manager, Remedial Projects

CRB/mfe Enclosures

cc:

Mr. Phillip Davis (ADEM)

Mr. G. Douglas Jones, Esq.

Mr. Thomas Dahl

Screening Level Ecological Risk Assessment (SLERA) for Operable Units 1, 2, and 3 of the Anniston PCB Site

**Anniston PCB Site Anniston, Alabama** 

Revision 1
December 2005



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## 1. Introduction

This report presents the Screening Level Ecological Risk Assessment (SLERA) for Operable Units (OUs) 1, 2, and 3 of the Anniston Polychlorinated Biphenyl (PCB) Site (Site). This SLERA is a deliverable under the August 4, 2003 Partial Consent Decree (CD) for the Site (United States Environmental Protection Agency [USEPA], 2002) and was prepared on behalf of Pharmacia Corporation and Solutia Inc. as signatory parties to the CD. Together, Pharmacia and Solutia are referred to as P/S. As described in the December 2004 Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan; Blasland, Bouck & Lee, Inc. [BBL], 2004), the SLERA comprises Steps 1 and 2 of the ecological risk assessment process, in which exposure and toxicity parameters for ecological receptors that may be present in OUs 1, 2, and 3 are biased toward conservatism (e.g., maximum concentrations in exposure media, most sensitive toxicity benchmarks) as per the USEPA guidance (USEPA, 1997a).

## 1.1 Purpose and Objective

The objective of this SLERA is to determine which constituents of potential concern (COPCs) and ecological exposure pathways associated with OUs 1, 2, and 3 represent a negligible risk and which represent a potential for adverse effects and require a more thorough assessment in a baseline ecological risk assessment (BERA). Screening of the COPCs is conducted using available data, with the understanding that the COPC list may be modified under an Adaptive Site Management (ASM) Process as additional chemical characterization data are collected. The screening level exposure pathways analysis is an evaluation of receptors and habitats, and is used to identify and document the presence of active and complete exposure pathways in OUs 1, 2 and 3 as an added component of the screening assessment process. Habitat areas within OUs 1, 2 and 3 that do not have active and complete pathways will be eliminated from further risk analysis, while habitat areas with active and complete pathways and where COPCs are either present above threshold concentrations or cannot be excluded due to lack of information will be passed to a BERA. The BERAs for OUs 1, 2, and 3 will be coordinated with the ecological risk assessment presently being planned for OU-4 of the Site.

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## 1.2 Technical Approach

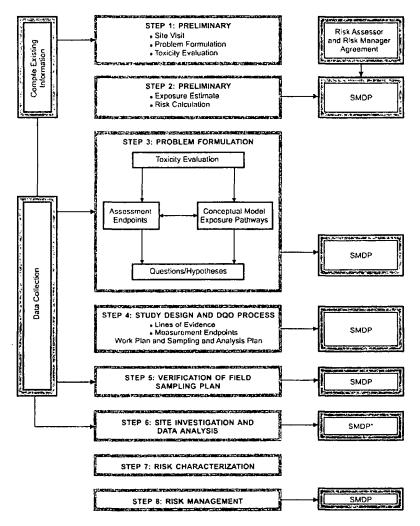
Data collected during investigations conducted under the Resource Conservation and Recovery Act (RCRA) Corrective Action Program were used to develop this SLERA. These data are presented and described in the *Phase I – Conceptual Site Model Report for the Anniston PCB Site* (Phase I CSM Report) (BBL, 2003) and the *Off-Site RCRA Facility Investigation (RFI) Report* (Off-Site Report; BBL, 2000b). These reports are the primary sources of information on exposure media concentrations as well as potential sources of chemicals, release mechanisms, exposure pathways and routes, and receptors applicable to the current assessment.

This report was developed in accordance with the CD and the eight-step process described by the USEPA in the Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment (see figure on next page, adapted from USEPA, 1997a) and follows the recommendations of the USEPA's supplemental guidance document, Amended Guidance on Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Activities, and Inclusion of Stakeholders (USEPA, 2000). The methodology developed by the USEPA provides a rational, science-based approach for evaluating ecological risks for remedial decision making and the Site administrative record. This report describes the completion of the screening level portion of the ecological risk assessment process using readily available exposure media data (Steps 1 and 2 of the ecological risk assessment process).

The initial screening for COPCs presented in this report follows a systematic process. The basic COPC identification process includes a comparison of PCBs and other constituent concentrations measured in environmental media to conservative screening thresholds. COPCs include substances in Table 1 of Exhibit F of the CD for the Site (USEPA, 2002) and the broader list of constituents identified by the USEPA in a letter to P/S dated March 13, 2003 (USEPA, 2003) and clarified in a letter dated August 19, 2005 (USEPA, 2005). The process for refining the list of COPCs will follow an ASM approach that incorporates the data and associated findings from OUs 1, 2 and 3 into the planning process. The ASM approach will also be used to refine and revise the receptors and exposure pathways evaluated in subsequent phases of the risk assessment. Incorporating ASM into the process to scope the supplemental investigations, if any, at OUs 1, 2, and 3 is a scientifically valid approach that is often used by the USEPA for planning and managing watershed issues (USEPA, 2004) and by governmental agencies for federal site restoration, as outlined in the recent publication from the National Research Council (NRC), Environmental Cleanup at Navy Facilities: Adaptive Site Management (NRC, 2003). The NRC has also recommended the use of ASM for sites with PCB-contaminated

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sediment (NRC, 2001). Much of the framework for the ASM process stems from recommendations by the Presidential/Congressional Commission of Risk Assessment and Risk Management that include multiple steps for problem formulation, process design, option identification, information gathering, synthesis, decision, implementation, and evaluation (Presidential/Congressional Commission, 1997). The ASM approach is also supported by recent draft guidance from the USEPA for contaminated sediment remediation.



USEPA's Eight-Step Process for Conducting Ecological Risk Assessments

Notes:

SMDP - Scientific/Management Decision Point

1-3

<sup>\* -</sup> Step 6 is only a SMDP if changes to the sampling and analysis plan are necessary.

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As a component of the overall systematic process, compounds for which environmental media data and/or ecological screening values (ESVs) are lacking and for which there are active or complete exposure pathways will be carried through to the BERA. Screening for active and complete exposure pathways is conducted using USEPA rapid bioassessment protocols (for aquatic habitats) and a site-specific modification of the terrestrial wildlife habitat evaluation procedures developed by the Kansas Department of Wildlife and Parks (KDWP, 2004).

## 1.3 Report Organization

In addition to this introduction, this report is organized into the following sections: Section 2 contains background information, including descriptions of the OUs, and pertinent historical details. Section 3 presents Steps 1 and 2 of the risk assessment process along with an exposure pathways analysis. A discussion of uncertainty is included in Section 4, and overall conclusions are presented in Section 5. References cited in the report are listed in Section 6.

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2. Background Information

2.1 Site Description

The Site is located in the north-central part of Alabama and has been evaluated extensively over the past 20

years. Work in OUs 1, 2, and 3 has included a combination of investigative and remedial efforts conducted

under the guidance of the Alabama Department of Environmental Management (ADEM) and the USEPA.

Historically, the efforts under RCRA have included the general areas of the Anniston Facility, which were called

the "On-Site" areas, and areas downstream of the Facility, called the "Off-Site" areas. These historical terms

have been replaced by "On-Facility" and "Off-Facility," since the entire Facility property is part of the Anniston

PCB Site. On-Site and Off-Site are now only maintained to reflect the actual titles of documents or specific

studies.

2.1.1 Operable Units 1 and 2 (OU-1/OU-2)

OU-1/OU-2 consists of both residential and non-residential properties located upstream of Highway 78 (Figure

1) up to and surrounding the Facility area (OU-3). The geography of this area includes properties that are

immediately north and east of the Facility that were historically part of the "On-Site" area, and non-residential

areas that have historically been addressed under the Administrative Order on Consent (e.g., the 11th Street

Ditch and West 9th Street Creek). The Administrative Order on Consent (AOC) was executed between Solutia

and the USEPA (USEPA, 2001).

The lateral bounds of the non-residential properties potentially include both floodplain and non-floodplain

properties. Given the immediate focus on the residential portions of the Site, the lateral extent of the non-

residential portions of OU-1/OU-2 will be established once the sampling of residential areas has been

sufficiently implemented. Residential properties located in the Oxford Lakes Neighborhood Zone (Zone OLN)

are also included in OU-1/OU-2. The residential properties included in this OU were selected based on the

specific land use classification addressed by the Non-Time Critical (NTC) Removal Agreement (Appendix G to

the CD), and the unique and specific requirements identified under the NTC Removal Agreement.

Although there are both residential and non-residential land uses in OU-1/OU-2, the OU as a whole is

contiguous and ecological receptor populations potentially inhabiting the area do not distinguish between human

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constructed land-use restrictions or artificial boundaries (i.e., dividing lines between residential and non-residential properties). Rather, the entire Snow Creek floodplain and stream channel could be contacted with equal probability, and the primary factor dictating ecological use of this area is habitat quality. The various land uses within OU-1/OU-2 are described in Section 3.1.1.

2.1.2 Operable Unit 3 (OU-3)

OU-3 consists of the Facility itself including the plant site, the South Landfill and the West End Landfill. This OU is bordered to the north by the railway, by Coldwater Mountain to the south, by Clydesdale Avenue to the east, and by First Avenue to the west (Figure 2). Investigative and remedial efforts in OU-3 have included surface and subsurface soils, groundwater, and air media. Major remedial efforts have been undertaken to control stormwater flow around the Facility and to contain Facility-related source areas. In addition, the consistent industrial character of this area and associated deed restrictions differentiate it from other areas of the Site.

2.2 Manufacturing History

Manufacturing operations at the Facility began in 1917. A variety of organic and inorganic chemicals have been produced at the Facility during its history, including PCBs, ethyl parathion (parathion), paranitrophenol (PNP), and phosphorus pentasulfide. The Facility currently manufactures polyphenyl compounds (non-halogenated) that are used in a variety of heat-transfer fluid, plasticizer, and lubricant applications. PCBs were produced at the Facility from the late 1920s to 1971. Chlorine was also produced at the Facility between the 1950s and 1969 for the sole purpose of supporting PCB manufacturing (Golder Associates, Inc. [Golder], 2002).

2.3 Regulatory Context

Completion of ecological risk assessments was identified as Task 5 for both OU-1/OU-2 and OU-3 in the RI/FS Work Plan (BBL, 2004). Initially, the SLERAs for the two OUs were developed separately, and the results were provided as Appendices E (OU-1/OU-2) and F (OU-3) of the RI/FS Work Plan. At the time the RI/FS Work Plan was submitted, plans were underway to conduct semi-quantitative surveys of resident biota in both OUs. The surveys were designed to provide additional empirical evidence to reduce uncertainty associated with the risk assessment process. After the semi-quantitative surveys were completed and P/S received USEPA's comments on the initial SLERAs, it became clear that there was no longer any compelling reason to maintain

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the two SLERAs as separate documents. As a result, this revision presents a combined SLERA for OUs 1, 2, and 3 and fulfills the commitments made in the RI/FS Work Plan and obligations outlined the CD.

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# 3. Ecological Evaluation

This SLERA closely follows the USEPA guidance for performing ecological risk assessments (USEPA, 1997a and 2000). SLERAs are conducted using assumptions that maximize the exposure and risk estimates so that only those chemicals that represent a *de minimis* risk are eliminated from further consideration. Those that potentially pose an unacceptable risk – based either on exceedance of screening thresholds or a lack of concentration or toxicological threshold data – are retained for consideration in subsequent steps of the assessment. The applicable risk assessment guidance documents have been considered in this analysis to identify chemical constituents detected in OUs 1, 2, and 3 that potentially pose a risk to resident ecological receptor populations. The three main components of this assessment include the problem formulation phase, ecological effects evaluation phase, and the exposure/risk calculation phase. Each phase/step is discussed below in context of the SLERA for OUs 1, 2, and 3.

The SLERA for OUs 1, 2, and 3 is associated with explicit boundaries, assumptions, and extrapolations that have a direct influence on how the results are interpreted and used. The limits are as follows:

- This assessment is limited to ecological receptor populations in OUs 1, 2, and 3.
- Data for exposure media were extracted from multiple sources available as of April 2004.
- A conservative approach was used in exposure and risk modeling where the highest validated media concentrations and lowest toxicity thresholds were combined to yield a high-end risk estimate.
- Existing media-specific benchmarks from the published literature were used (e.g., soil screening concentrations from USEPA Region 4).
- This assessment is deterministic in nature as it uses a single point estimate rather than distributions of input variables. As such, it does not include quantification of uncertainty in model input variables.
- A maximal exposure scenario is assumed, where ecological receptors live and forage in the area of concern 100% of their time (assuming an Area Use Factor of 1).
- The exposure pathways assessment step is enhanced to ensure that the only constituents forwarded to the BERA are those for which active or complete exposure pathways are present.

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## 3.1 Step 1: Screening Level Problem Formulation and Ecological Effects Evaluation

The purpose of the screening level problem formulation step is to develop a CSM that illustrates the flux of chemicals (considering fate and transport) relative to physical characteristics, potential exposure pathways of biota, specific ecological endpoints, and mechanisms of toxicity in OUs 1, 2, and 3 (USEPA, 1997a). As part of this step, Figures 3 through 7 were developed to illustrate the exposure pathways associated with OUs 1, 2, and 3, where ecological receptors may be exposed to PCBs and other COPCs via contact with sediment, surface water, floodplain soil, air, and food. These figures depict simplified ecosystems present in OUs 1, 2, and 3 and show the fate and transport and potential exposure pathways for the main COPC groups (PCBs and methyl mercury – Figure 3, metals – Figure 4, other semivolatile organic compounds [SVOCs] – Figure 5, volatile organic compounds [VOCs] – Figure 6, and organophosphorous pesticides [OPs] – Figure 7).

The ecological setting, potential former sources, and the COPCs are identified in Step 1. Fate and transport mechanisms at the Site (primarily for PCBs and methyl mercury), pathways and routes of exposure, potential receptors, and assessment and measurement endpoints are also discussed below with an ecological effects evaluation for screening purposes.

## 3.1.1 Ecological Setting

In a screening level risk assessment, an understanding of the ecological setting (habitat characteristics) is a critical component of the overall investigation (USEPA, 2000). Given its importance, the ecological setting of non-residential, residential, and industrial properties in OUs 1, 2, and 3 have been investigated by risk assessors and ecologists on three occasions: October of 2001; May of 2002; and October of 2003. Results from the October 2001 and May 2002 investigations were originally reported in the Phase I CSM Report (BBL, 2003), and the results from all three investigations with respect to the ecological setting are described below in terms of dominant features provided by Snow Creek, land use along the Creek, and land use at the Facility. Vegetation and wildlife species that were observed during Site visits are identified in Tables 1 and 2.

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3.1.1.1 Snow Creek

Snow Creek is a small urban drainage way that flows through the City of Anniston into the Town of Oxford, Alabama, before its confluence with Choccolocco Creek just south of Interstate 20 near the Choccolocco Creek Water Treatment Facility. Aquatic habitat in the upstream reaches of Snow Creek (north of U.S. Highway 78) is limited; there are drainage ditches along residential roads that flow into the Creek, and as it moves south it is heavily channelized through dense areas of residential, commercial, and industrial land use. In areas where concrete sluiceways channelize the Creek (Figures 8 and 9), substrate, aquatic vegetation, and bank features are lacking or are insufficient as habitat for aquatic organisms or wildlife. Previous studies have found that these areas, which are most prevalent above Noble Street, score low in habitat quality (BBL, 2000b). However, other areas of the Creek have not been altered to the same degree, specifically the portion of Snow Creek below Noble Street and above U.S. Highway 78. These areas have banks with riparian vegetation, a sandy-silt mix of substrate and depositional bars, and occasional riffle-run-pools (Figure 10). During heavy rains the surface water levels rise considerably in the Creek, and turbidity is visibly evident. At the southern limit of Snow Creek in OU-1/OU-2, surface waters flow into a long underground culvert beneath the Quintard Mall (Figure 11), which is an area devoid of any quality ecological habitat.

Because of the notable change in the portion of the Creek below U.S. Highway 78 and its similarities in important habitat characteristics to Choccolocco Creek, the lower portion of Snow Creek was included in OU-4. Thus, the southern border of OU-1/OU-2 is U.S. Highway 78.

Signs of habitat limitations include the dominance of organisms such as midges (*Chironomidae*) (Barbour et al., 1999) that occur in relatively high abundance (BBL, 2000a). Another indication of poor habitat quality is the presence of Alligator weed (*Alternathera philoeroides*), an exotic aquatic plant that is so dense in the Creek during warmer months that at periods of low flow it severely blocks the Creek channel. In other areas of the Creek where there are faster-flowing riffles over cobbled substrate (predominantly below South Noble Street), other species, including two families of mayflies (*Baetidae* and *Heptageniidae*), dragonflies (*Coenagrionidae*), dobsonflies (*Corydalidae*), riffle beetles (*Elmidae*), water scavenger beetles (*Hydrophilidae*), stoneflies (mostly *Hydroptilidae*), and several families of freshwater snails have been observed. In addition, sunfish have been observed using small pools of the Creek where there is adequate bank cover. Banks, riparian corridors, and floodplains of Snow Creek above Highway 78 are all modified by human development.

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Land Use Bordering Snow Creek

Several classifications of land use in OU-1/OU-2 were surveyed as potential habitat for wildlife. The findings

are described below.

Residential. Most of the habitat available to ecological species in these areas is limited to maintained lawns

with sparse and arranged ornamental (and often exotic/"non-native") trees and shrubs (Figures 12 and 13).

Impervious layers, as represented by paved driveways, rooftops, streets, or large parking areas, are present

throughout the residential communities and provide little, if any, significant habitat (Figure 14). Mowed lawns

of some residential properties are maintained right up to the edge of Snow Creek (Figure 15). In these cases,

there is little habitat in the form of cover or forage for terrestrial wildlife. In other locations where residential

properties do not border the Creek, riparian habitat along the top of the creek bank (although typically narrow)

provides some habitat for species of songbirds and "urban" wildlife (e.g., skunks, raccoons, squirrels, etc.).

However, these areas are somewhat isolated by surrounding dense, residential communities (and other land

uses), and therefore access is likely constrained.

Habitats associated with residential communities are most dominant in sections of OU-1/OU-2 immediately

north and south of Route 202 and to the west of Route 21 in Anniston (Figure 1). Several other residential

communities are present along the west side of Noble Street and on Main Street in Oxford.

Industrial. Land use in industrial areas is dominated by the presence of commercial buildings, manufacturing

facilities, junkyards, parking areas, railroad tracks, and areas with impervious cover (usually greater than 80%),

or if not impervious, groundcover disturbed by maintenance, excavation, or debris (Figures 16 and 17).

Potential habitats are primarily disturbed or abandoned fields, patches of urban scrub/shrub forest, or maintained

lawns with sparse ornamental trees and shrubs. Little or no wildlife were observed at locations throughout

industrial areas.

Commercial. Land use in commercial areas is dominated by retail structures, single stores, strip malls,

associated parking areas, landscaping, stormwater facilities, and areas with an impervious cover (usually greater

than 80%) (Figures 18 and 19). Potential habitats consist of maintained lawns, and sparse ornamental trees and

shrubs. Little or no wildlife were observed in these areas.

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**Recreational/School.** Land use in these areas is dominated by playgrounds, ball fields, and large areas of maintained and manicured lawns (nearly 100% cover) (Figures 20 and 21). Functional ecological habitats are confined to less regularly maintained fields where songbirds typical of urban environments were observed foraging.

Stormwater Retention Structure. Located just east of the Facility (OU-3), the retention structure is used to control the flow of surface water runoff directed from the South Landfill. The retention structure does not support either fully functional terrestrial habitat (because of frequent inundation) or fully functional aquatic habitat (because of concomitant drying). The habitat here is disturbed by the wetting and drying cycles, and it is mainly opportunistic – only rapid-colonizing aquatic and terrestrial species were observed in or around the retention structure.

Non-residential areas (primarily associated with transportation infrastructure, including roadways and railroad beds) are found throughout OU-1/OU-2. There is moderate density of transportation infrastructure in the residential communities within the City of Anniston. The proportion of such land uses is greater as one proceeds south along Snow Creek, Southern Railroad, Quintard Drive, and Noble Street towards Oxford. These main roads and the active railway through Anniston are used heavily by motorists and trains, respectively. In fact, it is this high density transportation infrastructure that limits the abundance and quality of terrestrial habitat by creating small, isolated patches of field or forested habitat.

Many of the terrestrial habitats that are provided by trees and shrubs (including a high proportion of non-native species) are confined to the steep altered edge of Snow Creek. Here, habitats are provided by mimosa (Albizia julibrissin), sycamore (Platanus occidentalis), box elder (Acer negundo), slippery elm (Ulmus fulva), privet (Ligustrum vulgare), white aster (Aster vimineus), and evening primrose (Oenothera biennis). These habitats are disturbed by pruning. Other locations where trees and shrubs are present are in small, undeveloped areas that border residential, commercial, or industrial properties near the Southern Railroad tracks. Major species in these habitats include mimosa (Albizia julibrissin), multiflora rose (Rosa multiflora), tree-of-heaven (Ailanthus altissima), and kudzu (Pueraria montana). These are invasive forms that have colonized the disturbed habitats in this area.

Both residential and non-residential land uses have altered the floodplain of Snow Creek. Over time, there have been many alterations to the Creek itself, and significant development of residential and non-residential properties within the floodplain have altered topography and floodplain boundaries. For example, the extensive

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concrete sluiceways in upstream reaches of Snow Creek eliminated bank habitat, substrate, and a functional

floodplain. Land is developed immediately along the Creek in these areas. In addition, the development of the

Quintard Mall directly on top of Snow Creek and the floodplain completely eliminates any habitat for aquatic or

terrestrial organisms. There are some areas of Snow Creek where small pools, riffles, and runs may provide

limited habitat for aquatic organisms; however, these areas are limited in size relative to the overall length of the

creek. For terrestrial habitats, the extensive developed land areas have consumed much of the contiguous

habitat that was in place before the development of Anniston and Oxford. What are left are only small, isolated

patches of disturbed land that have limited capacity to support wildlife communities.

3.1.1.2 The Facility

The Facility area (OU-3) is largely occupied by buildings, parking lots, other areas actively used for industrial

purposes, and impervious surfaces. As a result, "habitat" in this area is primarily characterized by impervious

surfaces (e.g., pavement, structures), with small strips and medians of mowed and maintained lawns and

decorative plantings. Based on direct observation of habitat characteristics, there does not appear to be a

functional ecosystem within OU-3. Furthermore, the Facility is fenced off, potentially restricting terrestrial

wildlife access to the area.

Land Use at the Facility

Several distinct areas within the Facility were surveyed to assess the presence or absence of potential ecological

habitat. The results are described below.

West End Landfill. The West End Landfill is a mowed and maintained capped landfill surrounded by

residential properties and parking lots (Figure 22). The landfill surface itself is open space, but there is little

habitat structure and no surface water. The intensely built environment of the surrounding parcels, including the

presence of an APCO substation, appears to render this area unattractive to ecological receptors.

Maintained Grounds (Northeast). Maintained parcels in the northeastern portion of the Facility are routinely

mowed, and surrounding areas are disturbed and managed. The area appears to have little or no ecological value

(Figure 23).

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**Open Area**. A small open area, containing picnic tables, trash cans, and walking paths is located in the southeastern portion of the Facility. This small area of open space has compacted soils, ornamental plantings, is limited in size, and is surrounded by larger areas that have little ecological value.

South Landfill. The South Landfill is routinely mowed and maintained in conjunction with the Facility's RCRA Permit requirements. Open space is limited to disturbed vegetation growing no more than 20 centimeters high. No surface water is present, and an interceptor dike/berm was installed to divert clean water away from the landfill area. There is no habitat structure (beyond the mowed vegetation), and no cover for wildlife (Figure 24). While rodents (voles and/or mice) or other small mammals like chipmunks might inhabit the mowed landfill surface, the open and exposed conditions do not favor larger, higher trophic level organisms. Surrounding parcels do support some habitat and edge environments, but these cut-over woodlots and second growth weedy parcels are small and subject to frequent disturbance. Because the surrounding parcels support some cover habitat, there is likely to be an incidental wildlife presence on the South Landfill. However, the South Landfill habitat itself appears to be poor and likely provides little or no ecological foundation for birds and mammals to feed or breed.

#### 3.1.2 Exposure Pathways Analysis: Habitat and Biological Assessment

USEPA guidelines for ecological risk assessments (USEPA, 1998) emphasize the importance of ecosystem and receptor characteristics in defining exposure pathways. In an expanded depiction of the ecological risk assessment framework (Figure 1-2 in USEPA, 1998), "measures of ecosystem and receptor characteristics" is given a central place in the analysis phase of the risk assessment. Together, characteristics of the ecosystems and receptors potentially subject to releases are used to define completed exposure pathways (USEPA, 1997a).

In June of 2005, a detailed biological survey and habitat assessment were performed to supplement the information provided above on the ecological settings within OUs 1, 2, and 3. The procedures followed in the biological surveys were approved by USEPA on June 8, 2005, and the use of biological indices to evaluate the biological survey data was discussed during an August 30, 2005 meeting and subsequent telephone conversations between USEPA and P/S. The approach is described in detail in the following sections of this report. This field work documented key ecosystem and receptor characteristics for defining screening level exposure pathways and determining pathways that must be forwarded to the BERA for further assessment. Field work for habitat and biological assessment elements was conducted by a team that included a participant

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from USEPA, who observed operations for quality assurance purposes, participated in field assessment decisions, and confirmed field observations.

The goal of the habitat and biological assessments conducted in OUs 1, 2, and 3 between June 9 and 14, 2005 was to reduce uncertainties associated with exposure pathways and potential ecological receptors. The methods and results of the habitat and biological assessments are presented here, and these findings are used to support a more detailed analysis of the relationship between ecological receptors and exposure at each OU.

Specific objectives of the habitat and biological assessments described in this section of the SLERA are as follows:

- Assess the type and quality of habitat provided by aquatic and riparian habitats in OU-1/OU-2 and terrestrial habitat in OU-3;
- Assess the presence and composition of the benthic macroinvertebrate (BMI) community in Snow Creek and a stormwater retention structure (OU-1/OU-2);
- Assess the presence and composition of fish communities in Snow Creek and a stormwater retention structure (OU-1/OU-2);
- Assess the use of the OUs by avian and terrestrial wildlife; and
- Assess the presence and composition of invertebrate, avian, and mammalian communities in OU-3.

#### 3.1.2.1 General Approach

Aquatic and riparian (creek bank) habitats are the primary habitat types associated with OU-1/OU-2, and terrestrial habitats are the primary habitat type associated with OU-3. The habitat assessment for pathways analysis is based on two different protocols, one for aquatic habitats and one for terrestrial. Each is described below.

1. <u>USEPA Rapid Bioassessment Protocols</u>. In 1999, the USEPA released a revised version of *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (RBP) (Barbour et al., 1999). This document lists protocols that are a synthesis of existing methods used by numerous federal and state agencies. Observations of aquatic habitat and biological organisms are collected and scored for each

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location where the protocols are applied. These protocols can be applied to a wide range of programs, including support of ecological risk assessments for aquatic environments. The methods described in the RBP document were used in the assessment activities performed in OU-1/OU-2 (Snow Creek) and the stormwater retention structure. These protocols cannot be used for terrestrial habitat evaluations.

2. Kansas Department of Wildlife and Parks Method. The KDWP has published a method for the quantitative evaluation of terrestrial wildlife habitat quality (KDWP, 2004). The Kansas Parks Method (KPM) is a terrestrial analog of that used in the RBP, and represents a consolidation of methods used by Kansas State agencies and the U.S. Soil Conservation Service. The method is used to assign a value from 0.0 to 10.0 (a KP Value Score) to represent the quality of an evaluated habitat compared to an optimum habitat, which is represented by a score of 10. The method focuses on terrestrial habitats of woodlands, rangeland, pastureland, cropland, wetlands, and odd areas. The KPM was applied to terrestrial habitat quality assessment activities performed in each of the OUs by comparing Site habitat quality values to the conditions expected in a fully developed regional "climax" community of forest and woodland. As published, the KPM is designed for applications in natural and/or agricultural landscapes, and the method incorporates a habitat interspersion score to account for the quality of habitats adjacent to the assessment location. The KPM interspersion parameter is evaluated by categorizing adjacent habitats as woodland, rangeland, pasture, wetlands, cropland, odd areas, or streams and impoundments. As described in Section 3.1.1, habitat components of OU-1/OU-2 and OU-3 are isolated patches in intensely developed, urbanized, and managed landscapes. To apply the KPM at the Anniston PCB Site, a Site-specific interspersion factor was incorporated to account for the developed, urban nature of the watershed. This interspersion factor of -1.0 was applied to the KP Value Score resulting from the characteristics of the highest quality habitat in each evaluation area. This modification extends the KPM and makes it applicable in the land use matrix along Snow Creek and in OU-3.

The technical basis for using the KPM at the Site was to provide, in addition to the RBP developed by USEPA for aquatic habitats, a semi-quantitative means for scoring terrestrial wildlife habitats. Much of the terrestrial habitat that exists at the Site is confined to narrow (and sometimes fragmented) bands of habitat along Snow Creek that are surrounded by a well-established urban setting of commercial, industrial, and residential land uses. In addition, terrestrial habitats at the Facility are primarily those that result from successional changes that arise from frequent land management practice (i.e., mowing, bush-hogging, capping, etc.). The KPM is a useful

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tool for picking up where the RBP leaves off – at assessing the value of terrestrial habitats above the river bank and in OU-3.

However, it is important to point out that by design the KPM can only be applied to those areas where wildlife habitat is actually present. The method highlights woodland, rangeland, pasture, cropland, wetland, and odd areas for evaluation, and scores (called component points in the method) are presented on a positive scale. For example, in odd areas, the method seeks to score (at a minimum) the positive attributes of cover provided by woody or herbaceous vegetation, even if this vegetation is non-native. Negative scores are possible, but usually only when adjacent habitat is absent.

For this Site, the data that were evaluated in the KPM were collected from wildlife habitat transects specifically established in fragmented and/or narrow areas where habitat is present. Areas adjacent to these habitats were almost always larger, primarily occupied by active human uses or actively managed, and completely devoid of habitat features (i.e., parking lots, railroad tracks, abandoned construction equipment, etc.). It is this aspect of habitat quality that is reflected in the Site-specific interspersion score for the Anniston application of the KPM method. To apply the KPM, we scored each location on the KPM field key following assessment guidance in the methods description. Locations were scored from field notes, field photographs, and aerial photographs following completion of the field surveys. The initial scores were then adjusted by applying the Site-specific interspersion factor of -1.0 to account for the developed, urban nature of the area.

Results (summarized in Table 6) are described in more detail below. Field notes, field data sheets, and copies of pages from the field book are provided in Appendix A<sup>1</sup>, and photographs of OU-1/OU-2 and OU-3 are included as Figures 8 through 24. The photographs of OU-1/OU-2 show the wide variety of land use in the area. Since the majority of OU-1/OU-2 does not contain "surveyable" wildlife habitat due to the dominance of residential, commercial, and industrial land uses and the KPM cannot be applied where there is no habitat, much of the OU was not included in the habitat and biological assessment. The survey locations were therefore purposefully biased toward the highest quality habitat present in OU-1/OU-2.

<sup>&</sup>lt;sup>1</sup> There are some entries in the field data sheets that refer to the field book for more information. Pages from the field book are also included in Appendix A.

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3.1.2.2 OU-1/OU-2

Station reconnaissance, habitat, and biological surveys for OU-1/OU-2 were conducted between June 9 and 16,

2005. The overall approach used by the field ecologist team was to preliminarily identify station locations,

confirm tasks, and initiate data collection in support of the RBP and KPM. Detailed methods for data

collections are described below. Results are described in Sections 3.3.1 and 3.3.3.

3.1.2.2.1 Station Siting

A preliminary reconnaissance was conducted by field ecologists before implementing the RBP methodology for

Snow Creek to identify sample locations. Five sampling reaches for OU-1/OU-2, each approximately 100

meters in length, were distributed along Snow Creek (Figure 25). These reaches were selected to reflect

conditions that adequately represent the natural heterogeneity of habitats that exist in Snow Creek. Data

collected during previous investigations and reconnaissance activities indicate that significant portions of Snow

Creek have been stabilized, channelized, and/or hardscaped to the point that natural conditions no longer exist in

these areas. The channelized areas fragment the natural order of Snow Creek such that the continuity of

hydrogeomorphic processes is disturbed. These areas were not surveyed as habitat. The five sample reaches

that were assessed are indicative of the range of remnant natural conditions (pools, riffles, runs with natural

substrate) that currently exist in Snow Creek.

In addition to Snow Creek, previous reconnaissance efforts identified the stormwater retention structure east of

the Facility as a feature that may provide aquatic habitat. As such, the retention structure was selected as a sixth

biological assessment sampling location. Figure 36 presents the stormwater retention structure biological

assessment sample locations.

3.1.2.2.2 Biological Reconnaissance (BioRecon)

Following a confirmation of sample locations in Snow Creek, a modified version of the BioRecon evaluation

technique, outlined in the RBP Guidance, was used at each sample reach to confirm that the reach was suitable

for further assessment. Multiple habitat types were consistently present in each reach, and RPB protocols for

further sampling within a multiple-habitat reach were used. Kicks and/or jabs with a standard D-ring net [0.3]

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meter opening with 500 micrometer (µm) mesh] were used to sample the substrate for BMI in subhabitats. A jab consisted of sweeping the D-ring net through aquatic vegetation or against a vegetated rock for a distance of 0.5 meters. A kick consisted of placing the head of the net against the substrate, so that the net opening was facing upstream, then disturbing the sediment in front of the net for a distance of 0.5 meters and allowing the substrate temporarily suspended in the water column to drift with the current into the net. In pooled water without current, the net was gently moved through the water above the disturbed area to collect the kick sample. In accordance with the BioRecon protocol, four kicks or jabs were distributed among the different habitat types. If fewer than four habitat types were identified, one jab/kick was performed in each habitat and the remaining jabs/kicks targeted the most productive habitat type. After collection of the 4-kick/jab sample, the contents of the net were emptied into a shallow pan. Invertebrates were separated from the litter, and the specimens were identified and enumerated in the field by an aquatic ecologist. BMI tallies were evaluated to characterize the suitability, productivity, and habitability of the assessed stream reach. Each reach assessed during BioRecon activities was evaluated based on these characteristics and then evaluated as part of a detailed BMI community assessment. Distribution of the sampling effort in each reach is presented in Table 7.

#### 3.1.2.2.3 Habitat Assessment

## Aquatic and Creek Bank

Aquatic and creek bank habitats in Snow Creek along each sampling reach were evaluated using RPB methods. Assessment activities were conducted by a team of three ecologists. Initially, the field team walked the length of the reach to get an overview of available habitat types and stream reach features and to reach consensus on the representativeness of sample locations in the reach. The upper and lower boundaries of the reach were recorded using Global Positioning System (GPS) coordinates. General information and physical characterization observations were recorded on the Physical Characterization/Water Quality Field Data Sheet provided in the RBP Guidance. Completed field data sheets are included in Appendix A. Water quality assessment information was collected from the area of the reach best representing flow, depth, and substrate conditions for the entire reach. Water depth was measured with a survey rod marked in tenths of a foot (ft). Flow rate was measured using a Marsh-McBurney Flowmate 2000 flowmeter. Surface water quality parameters (pH, temperature, conductivity, turbidity, dissolved oxygen, and oxidation-reduction potential) were measured using a Horiba U-22 in situ multi-parameter probe. Flow rate and water quality parameters were collected from approximately 0.5 ft above the sediment surface to characterize benthic conditions. Sampling personnel

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approached the measurement location from downstream and remained downstream during measurement to avoid substrate disturbance in the vicinity of the probes. Surface water information was recorded on the Physical Characterization/Water Quality Field Data Sheet provided in the RPB Guidance. Completed field data sheets and pages from the field book are included in Appendix A.

After water quality information was collected, the field team conducted a visual-based habitat assessment, scored each reach, and recorded the information on the Habitat Assessment Field Data Sheet provided in the RBP Guidance. Completed field data sheets are included in Appendix A. The field team discussed each variable or parameter to develop a consensus-based score. Periodic quality assurance spot checks of precision and accuracy between team members were performed to assess a parameter individually, and then compare the individual assessment to those from other team members. The variability between scores and an explanation of factors responsible for the variability (i.e., differences in parameter interpretation, greater significance of certain variables, etc.) was discussed to establish consistency between team members.

Terrestrial

Terrestrial habitats in OU-1/OU-2 were assessed based on a general description of primary habitat, approximate percent cover of habitat types, dominant vegetation, vegetation density, vegetation height, bordering land use, and evidence of natural or anthropogenic disturbance. The qualitative habitat evaluations were collected as additional data at each of the sample locations in Snow Creek and in the stormwater retention structure.

3.1.2.2.4 Benthic Macroinvertebrate (BMI) Community Assessment

Habitat types varied between and within the individual sampling reaches. As such, a multiple-habitat sampling technique was chosen to proportionally represent each habitat type present in the sampling reaches along Snow Creek. Suitable and productive habitat types retained during the BioRecon stage for detailed assessment were sampled during the BMI community assessment activities. Each habitat type within a sampling reach was assigned a percentage representing the portion of that reach covered by that habitat type. A combination of 20 jabs and kicks were divided among the habitat types according to the given percentages (i.e., Habitat A covered 20% of the reach; therefore, 4 kicks were performed in that habitat). The composite of the 20 jabs and/or kicks represented the sample for that reach. The composite sample was sieved in a 500 µm sieve bucket, the remaining material was transferred to a shallow pan where large debris was rinsed and removed, and

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observations of BMI were recorded. After a short observation period, the sample was decanted through cheesecloth, transferred to a 1-liter (L) plastic sample container, preserved with 70% isopropyl alcohol and glycerin, labeled, sealed, and stored using complete chain-of-custody procedures. Samples were submitted to Normandeau Associates in Stowe, PA for sorting, identification, and enumeration. Completed data sheets from the laboratory analyses conducted by Normandeau Associates are included in Appendix A. Distribution of the sampling effort in each reach is presented in Table 7.

## 3.1.2.2.5 Fish Community Assessment

A fish community survey was conducted in each sampling reach of Snow Creek and in the stormwater retention structure to identify and estimate abundance of fish species. Each member of the field team obtained a scientific collectors permit from the State of Alabama Department of Conservation and Natural Resources prior to beginning collection activities. Copies of the permits are included as Appendix C. Fish survey activities were conducted at least 12 hours after the BMI community survey activities to avoid biased data resulting from the previous sampling disturbances. Additionally, no rainfall was recorded within the 48 hours prior to sampling. Fish were collected using non-lethal measures, including block netting and electrofishing. Because of the shallow nature of the stream channel in each sampling reach, electrofishing equipment was limited to a batterypowered backpack unit. Block nets, consisting of 3/16-inch polyester mesh with floats along the top and a leadline at the bottom, were placed at the upper and lower limit of the reach to minimize or eliminate movement of fish in and out of the sampling reach during collection. First the downstream net was placed, making sure to minimize disturbance of the stream. The field team exited the stream downstream of the lower net and moved along the bank to the upper extent of the reach to place the upstream net. Once the nets were installed, the field team, made up of one person with the electrofishing unit and two people with catch nets and livewell totes, entered the stream reach and began shocking at the downstream block net. The team moved in an upstream direction, making sure to shock the entire width of the stream reach as they progressed. Fish placed into taxis by the electricity were netted and retained in the livewells for processing. A running tally of non-target animals (i.e., frogs, crayfish, and turtles) was kept, and returned to the water following identification.

Upon completion of the shocking exercise, the field team sorted, identified, and enumerated the catch. A subset of up to 25 individuals of each species was weighed and measured. A voucher collection, composed of a few individuals of each species observed, was also retained. These specimens were placed in jars and preserved with 70% isopropyl alcohol and 4 milliliters (mL) of glycerin. The remaining live fish were returned to the

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stream reach from which they were taken. Representative individuals of species unable to be identified in the

field were preserved in an isopropyl alcohol/glycerin solution. Photographs of specimens collected are

presented in Appendix B.

3.1.2.2.6 Wildlife Assessment

Wildlife use at each station was documented throughout each of the activities conducted in Snow Creek and

recorded in a field log book. The field team also conducted a detailed wildlife survey at each stream reach and

riparian area by walking two 50-foot transects perpendicular to the stream reach through the stream bank and

riparian zone. While walking each transect, the field team recorded observations of wildlife, including both

sightings, signs (scat, feeding stations, tracks, burrows, etc.), and songs. Transect locations were recorded using

GPS.

3.1.2.3 OU-3

Station reconnaissance, habitat, and biological surveys for OU-3 were conducted on June 14 and 15, 2005. The

overall approach used by the field ecologist teams were to preliminarily identify station locations, confirm tasks,

and initiate data collection in support of the RBP and KPM. Detailed methods for data collections are described

below. Results are described in Sections 3.3.2 and 3.3.3.

3.1.2.3.1 Station Siting

A preliminary reconnaissance of habitat types and review of aerial photography was evaluated by field

ecologists before implementing an approach for conducting habitat assessments, soil/grass invertebrate surveys,

and wildlife surveys in OU-3. Information collected during this reconnaissance was used to derive the number

of sample points, or transects that were used to record observation on habitats and wildlife. The overall

approach is described in the sections below.

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3.1.2.3.2 Habitat Assessment

Habitats in OU-3 were assessed based on a general description of primary habitat, approximate percent cover of

habitat types, dominant vegetation, vegetation density, vegetation height, bordering land use, and evidence of

natural or anthropogenic disturbance. Qualitative habitat evaluations were collected as additional data at each of

the survey locations within OU-3. To assure a conservative bias in the screening analysis, observations were

conducted in the most favorable habitat available at each location. In this "patchy" landscape, the areas of

favorable habitat were generally small and isolated by intervening areas entirely lacking functional habitat.

3.1.2.3.3 Soil/Grass Terrestrial Invertebrate Community Assessment

Soil and grass invertebrate surveys were conducted in four general areas of OU-3: Maintained Facility Grounds

(5 samples); Open Area (1 sample); West End Landfill (4 samples); and South Landfill (9 samples) for a total of

19 core samples. Locations where sampling occurred were recorded using GPS.

The soil and invertebrate community surveys were conducted using two methods. Soil invertebrates were

sampled using a 1-foot polyvinyl chloride (PVC) or Lexan tube. Core sampling at each predetermined sampling

location was used to collect the biologically active layer of the soil. Where grass was at sufficient height

(greater than 6 inches) sweep nets were used to sample phytophilous invertebrates. Samples were sieved and

then placed in pans to more easily sort and identify invertebrates in the field. In samples where invertebrates

were numerous, only the first 100 individuals were counted. These procedures are similar to the RBP for

aquatic systems. The data were reported as raw counts and relative abundance (as percent) and recorded in field

books.

3.1.2.3.4 Wildlife Assessment

Wildlife community surveys were conducted in the four general areas of OU-3: Maintained Facility Grounds,

Open Area, West End Landfill and South Landfill (Figure 38). Observations were made along three transects

running the length of each sample area. The focus of the wildlife survey was to document the use of OU-3

habitats by birds and mammals either directly or by signs. The survey included a reconnaissance of each sample

area and was conducted simultaneously with the invertebrate survey. In addition to direct observations, the

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ecologists documented wildlife tracks, scat, burrows, daybeds, nests, browse, and any other signs observed in the field.

#### 3.1.3 Identity of Former Sources

Investigations of both current and historical sources of Site-related constituents at the On-Facility area were initiated in 1979 and have continued to the present. During this time, a substantial database of information and analytical results has been generated for all environmental media of interest (BBL, 2000b and 2003). The potential sources of releases from the Facility into Snow Creek include:

- South Landfill Solid Waste Management Unit (SWMU) 1 Parathion and para-nitrophenol (PNP) have been reported in groundwater from the landfill. Groundwater from the unit is being managed by pumping from the Western and Northern Corrective Action Systems. The cap in this area has also been expanded and upgraded.
- Landfill Catchment Basins (SWMU 2) These former unlined units captured stormwater runoff from Waste Management Area-1 (WMA-I) and were included in the WMA-I closure.
- Phosphate Landfill (SWMU 6) This unit was a neutralization pit that provided pre-treatment of acidic scrubber water from the parathion furnace area prior to discharge to the Phosphoric Acid Basins (SWMU 12). No releases were identified in the RCRA Facility Assessment (RFA).
- Santotar® Pit (SWMU 7) This unit managed Santotar®. No releases were identified in the RFA.
- Old Limestone Bed (SWMU 8) This unit managed wastes from the PNP and parathion processes.
   Soils beneath the unit contained PNP and parathion. Groundwater from this unit is currently being managed by the Old Limestone Bed Surface Impoundment (OLBSI) Corrective Action System.
- Lagoon (SWMU 9) This unit may have handled wastewater containing PNP, parathion, and methyl
  parathion. Groundwater from this unit is currently being managed by the OLBSI Corrective Action
  System.
- Phosphoric Acid Basins (SWMU 12) These unlined units were used to neutralize acid wastewaters from various production processes. No releases were identified in the RFA.
- Scrap Yard Waste Oil Satellite Accumulation Area (SWMU 17) This unit managed used compressor oils. Staining on the pad, gravel, and surface soils was observed during the RFA.
- Boiler Feed Tank (SWMU 25) This unit managed Therminol<sup>®</sup> ends. A leaking flange was observed during the RFA. The tank has since been dismantled.

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- Santotar<sup>®</sup> Tank (SWMU 27) This unit managed Santotar<sup>®</sup>. Black stains were observed on the concrete pad during the RFA. Investigation revealed that the stains were associated with pipe insulation.
- Steam Cleaning Pad (SWMU 31) This unit manages oily condensate from steam cleaning. No releases were identified in the RFA.
- Old Boiler Scrap Yard (SWMU 34) This unit manages used, decontaminated equipment and scrap
  metal. Some stained gravel was observed in the area during the RFA. Further investigation suggested
  that the staining was associated with rust deposits.
- Stormwater Drainage System Production Area Portion (SWMU 37a) This system managed stormwater runoff from the polyphenyl and parathion production areas.
- Former Parathion Production Area (SWMU 41) The buildings have been demolished in this area, and potentially affected soils have been removed. No releases were identified in the RFA.
- Former PCB Production Area (SWMU 42) The buildings in this area have been demolished, and the area has been covered with asphalt.
- Former Phosphorous Production Area (SWMU 43) Wastewater from this unit was discharged to the Phosphoric Acid Basins (SWMU 12). The buildings in this area have been demolished, and potentially affected soils have been removed. No releases were identified in the RFA.
- Waste Drum Satellite Accumulation Area (SWMU 44) This unit manages drums of Therminol<sup>®</sup> and Santotar<sup>®</sup> and potentially hazardous wastes awaiting toxicity characteristic leaching procedure (TCLP) analysis. No releases were identified in the RFA. Based on results from the RFI soil sampling, this area was capped with concrete.
- Former Holding Tanks, Aeration Basins, and Clarifiers (SWMU 46) These units treated wastewaters that contained parathion, PNP, and acetone still bottoms. No releases were identified in the RFA.
- West End Landfill (SWMU 47) Corrective measures implemented at in this area include construction of a multi-media cap composed clay, a high-density polyethylene (HDPE) liner, drainage fabric, cover soil, and a vegetative layer, as well as the installation of surface water runoff controls.
- Product Storage Tank (Area of Concern A) This tank managed Santowax<sup>®</sup>. The base of the secondary containment was previously gravel, and evidence of spills was noted during the RFA. The gravel has since been removed, and the containment system has been upgraded.
- Snow Creek Off-Site Assessment (Area of Concern B) PCBs have been identified in sediments in drainage ditches leading toward Snow Creek and in a portion of Snow Creek. Between 1986 and 1990, a sediment delineation and removal project was implemented. Additional sampling has been conducted

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since 1994 and sampling results have been reported to the ADEM. Large-scale drainage improvements, including the installation of extensive cap and cover systems, have been implemented north and east of the Facility. In addition, in 2004 the 11<sup>th</sup> Street Ditch was lined with shotcrete. This remedial action was carried out under CERCLA in accordance with the requirements of an AOC for the Removal Actions (USEPA, 2001).

- MCC Warehouse A PCB flaker unit historically operated in this area. During 2002, efforts to remove
  and isolate PCB-containing materials were implemented as an ICM. This area has been identified as an
  SWMU, but has not been formally incorporated in the RCRA Post-Closure Permit. Once it has been
  incorporated, it will be assigned an SWMU number.
- Underground Product Storage Tanks (USTs) (Area of Concern C) Four product USTs were removed in the mid-1980s. Three of these tanks were later determined to be in-ground process vessels. The fourth tank was used to store gasoline for a fueling pump at the plant. No evidence of releases was recorded at the time of the removal of the four tanks and no releases were identified in the RFA.

Indirect sources of Facility-related chemicals to other OUs historically may have included soil runoff and subsequent sedimentation and transport from the On-Facility areas, discharge of groundwater from the Facility, and sediments from Facility drainage ditches. Substances also may have been transported by past deliberate human activities not associated with the historical operations and waste management practices at the Facility, such as the disposal of foundry sand, landscaping activities involving relocation of dredged sediment or floodplain soils, and other industrial and commercial operations occurring in the floodplain, as well as other discharges to Snow and Choccolocco Creeks. These activities may have resulted in the presence of PCBs, metals, or other constituents in the floodplain and creek sediments that are not associated with the operations and waste management practices of the Facility.

#### 3.1.4 Constituents of Potential Concern

The COPC selection process is outlined in both the *RFI/CS Report for the Anniston. Alabama Facility* (RFI/CS Report) (Golder, 2002) and the Phase I CSM Report (BBL, 2003) and focused on chemicals associated with Facility-specific activities. This is consistent with the definition of the Site provided in the CD (USEPA, 2002) and USEPA guidance, which recommends that a preliminary identification of potential exposure include the identification of the "types of chemicals *expected* at the site" (USEPA, 1989 [emphasis added]). The screening

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process is designed to identify those Facility-related compounds that represent a "negligible ecological threat" because of either low inherent toxicity or low concentrations. Because the Facility was associated with past production of PCBs and these constituents are persistent in the environment, off-Facility environmental sampling historically has focused on PCBs. Thus, the current SLERA addresses PCBs as the primary COPC, even prior to performance of this risk-based screening step. This historical focus on PCBs has led to the paucity of environmental media data on other constituents. These data gaps are acknowledged and addressed by including substances that are identified in the CD as well as a wider list of chemical constituents requested by the USEPA. There are not sufficient screening level data for many of these constituents; thus, they will be evaluated in the BERA if the exposure pathways for these chemicals are potentially complete.

The complete COPC list identified in the CD included 17 non-metals (i.e., OPs; SVOCs, including PCBs; and VOCs) and 11 metals that could be designated as COPCs associated with the "historical and ongoing operation and waste management practices" of the Facility. The identified COPCs, which were also included as Table 1 of Appendix F of the CD for the Site (USEPA, 2002), include the following substances:

## Organophosphorus Pesticides

- Parathion
- Methyl parathion
- Tetraethyldithiopyrophosphate (Sulfotepp)

## **Volatile Organic Compounds**

- Chlorobenzene
- Isopropyl benzene (Cumene)
- Methylene chloride
- 1,1,2,2-Tetrachloroethane

#### Semivolatile Organic Compounds

- 1,2-Dichlorobenzene
- 1,4-Dichlorobenzene
- 2,4-Dichlorophenol
- PNP or 4-nitrophenol
- PCBs
- Phenol
- Pentachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol
- o,o,o-Triethylphosphorothioate

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#### Metals

- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cobalt
- Lead
- Manganese
- Mercury
- Nickel
- Vanadium

In addition to the COPCs listed in the CD, the USEPA identified additional constituents potentially present at OUs 1, 2, and 3 in its March 13, 2003 letter (USEPA, 2003) and in the clarifications provided in a letter dated August 19, 2005 (USEPA, 2005), that have been added to the overall list of COPCs. Analytical data for soil, sediment, fish tissue, and surface water for these COPCs, where available, were used in this SLERA.

A significant number of interim corrective measures have been completed at the Facility in the form of a variety of permeable and impermeable source barrier layers. These barrier layers inhibit direct contact with impacted surface soils and reduce the mobility of impacted soils, both through the air pathway (dust or volatilization) and through the surface water runoff pathway. These interim corrective measures have decreased ambient levels of COPCs and this has led to lower exposure potential to ecological receptors at the Facility. Volatility and/or low persistence of some compounds (i.e., VOCs and parathion) also leads to reduced environmental concentrations and the potential for exposure. Soil data for the Facility confirm that PCBs, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and vanadium are detected in surface soils.

#### 3.1.5 Chemical Transport and Fate

## 3.1.5.1 Polychlorinated Biphenyls

The transport pathway for sediment includes potential erosive forces from water flow that may dislodge the sediment from its original location and deposit sediments once surface water velocities have declined to a point where the sediment particle(s) will no longer remain suspended in the water column (NRC, 2001). High-flow events play a significant role in the transport of sediment-bound PCBs within Snow Creek. In addition to sediment erosion and deposition, sediment particles may also be mixed within the sediment or released to

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surface water via burrowing action or disturbance by benthic organisms, fish, turtles, or terrestrial organisms (NRC, 2001). Human disturbances (e.g., NRCS dredging as discussed in the *Dredge Spoil Area RFI/CS Phase I Report, Snow and Choccolocco Creeks, Calhoun and Talladega Counties, Alabama* [Roux Associates, Inc., 1999]) also contribute to the release and transport of sediment. In addition to the movement of sediment particles, this transport pathway includes the potential for dissolution of PCBs from the sediment particles. However, given the affinity of PCBs for sediment (NRC, 2001), dissolution is considered a relatively minor fate and transport mechanism in OU-1/OU-2.

In addition to surface water transport, other mechanisms may be responsible for the relocation of PCB-containing soils and sediments. Typical non-surface water transport mechanisms include the direct disposal of PCB-containing materials such as foundry sand, or the relocation of existing sediment, foundry sand, or floodplain soils. Relocation activities are often conducted to raise the elevation of the ground surface in low-lying areas of the floodplains that frequently flood. Data collected to date indicate that these mechanisms are important in OU-1/OU-2.

#### 3.1.5.2 Metals

In general, metals in the environment have complex behaviors and their fate is influenced by a number of physical and chemical variables. In water, soil, or sediment, metals undergo oxidation-reduction reactions, ligand exchange, precipitation, and biotransformation. These processes are controlled by constantly changing oxidation-reduction potential, pH, sulfide ions, iron, temperature, and salinity of the receiving system. As a result, it is difficult to predict a metal's fate and toxicity in a given medium, but it is possible to identify some generalities. For example, compared to PCBs, metals can be far more soluble and, thus, more bioavailable to plants and biota for direct uptake. Unlike PCBs, metals can sorb and desorb from soil and sediment with equal ease, depending on the metal and the physical and chemical conditions at a particular site or moment in time. Depending on the valence state or the nature of the element, metals may be transported via soil or sediment particles through water flow or wind dispersion. Furthermore, although most metals may be absorbed into plant or animal tissues, they generally do not biomagnify in higher trophic levels. Given the complex and diverse nature of metal behavior in the environment, it is difficult to discuss this group of COPCs beyond this general description. A more detailed discussion of the transport and fate of the individual metals retained for further analysis will be included in the BERA.

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#### 3.1.5.3 Semivolatile Organic Compounds

SVOCs, especially those containing chlorine atoms, are relatively persistent in the environment. The higher the number of chlorine atoms, the more likely the SVOC will be persistent and more difficult to degrade. Moreover, the highly substituted molecules are also more likely to be present in the ionic form in the environment. The ionic form controls the fate and transport of SVOCs according to the pH of the receiving medium. In the normal range of pH, chlorinated SVOCs normally exist as an ionic species. This leads to increased water solubility and mobility (and subsequent transport) in the aqueous phase. In air, soil, and water, half-lives are measured in hours. In groundwater and sediment, they are measured in days. The main degradation processes for SVOCs are photolysis and biodegradation. The ionized state of SVOCs also reduces sorption potential and causes increased mobility in soil and sediment (unless oppositely charged particles are encountered). With decreased sorption, there is increased potential for volatilization and transport via air. In neutral form, chlorinated SVOCs tend to have low water solubility but increased capacity for sorption. Some SVOCs may enter the food chain and accumulate in biota to some degree. For example, 2,4-dichlorophenol has a bioaccumulation factor (BCF) ranging from 1.53 for goldfish to 9 for algae. A highly substituted pentachlorophenol may have a BCF as high as 10,000 in fish. Therefore, food chain transfer is important for SVOCs.

#### 3.1.5.4 Volatile Organic Compounds

This group of chemicals is characterized at times by extreme volatility. For example, chlorobenzene will evaporate entirely from an undisturbed solution within 72 hours. As a result, air plays the main role in the environmental transport and degradation of VOCs released into the environment. Once in the atmosphere, VOCs tend to degrade rapidly due to their strong absorptive affinity for ultraviolet rays. The typical half-life of chlorobenzene in air is 20 to 40 hours. Although VOCs have moderate solubility in water, they are rarely found in ambient water samples due to their volatility. However, they sometimes can be detected in groundwater, where the potential for volatilization is limited. In addition to volatilization, VOCs are readily biodegraded. Therefore, concentrations of VOCs in soil, sediment, or water are usually low unless there is an active groundwater recharge zone.

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3.1.5.5 Organophosphorus Pesticides

OPs such as parathion and sulfotepp tend to be of relatively low persistence in soil under normal label use. The

reported field half-lives in soil range from 1 to 30 days. Under conditions favorable to degradation (high heat

and sunlight), OPs may not last more than few days on the surface of soil. However, when large quantities of

OPs are found in one location (perhaps as a result of a spill), degradation may take years. With moderate

propensity for adsorption to organic and inorganic particles, OPs can be moved via soil and sediment transport

mechanisms. However, their normally low residence times preclude them from being significantly mobile.

Being soluble, OPs may also be transported via water flow, but since these pesticides break down in water, the

total transported distance may be limited. Temperature plays a factor in how quickly OPs degrade, and OPs do

not volatilize extensively. Uptake of OPs by plants and animals is rapid, with subsequent distribution within

tissues and organ systems. In animals, OPs are readily absorbed into the bloodstream from the skin, lungs, or

gut, and OPs can be moderately bioaccumulative in body lipids. However, the metabolism of lipid stores in the

liver also brings about the degradation of OPs. The degradation products are excreted via urine.

3.1.6 Potential Pathways and Routes of Exposure

USEPA guidance on conducting ecological risk assessments defines exposure pathways as "the paths of

stressors from the source(s) to the receptors" (USEPA, 1998). USEPA (1997a) describes a complete exposure

pathway in terms of four components:

1. A source and mechanism of chemical release;

2. A relevant transport medium;

3. A receptor at a point of potential exposure to the affected medium; and

4. A route of uptake at the exposure point.

If any one of these four components is not present, a potential exposure pathway is considered incomplete and is

not evaluated further in a risk assessment. If all four components are present, a pathway is considered complete.

Complete exposure pathways can be further delineated into those expected to be insignificant due to minimal or

unappreciable exposure potential (secondary exposure pathways) and those expected to have more significant

exposure potential (primary exposure pathways).

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Exposure routes are the "point of contact/entry of a contaminant from the environment into an organism" (USEPA, 1997b). Potential exposure routes for terrestrial animals include inhalation, ingestion, and dermal absorption. Ingestion can either be direct (e.g., incidental ingestion of soil while foraging) or indirect (e.g., ingestion of constituent-containing plants or prey). For aquatic organisms, the potential exposure routes are direct contact with the constituent in water or sediment (with gill or integument) and ingestion of food.

The existing sources of the predicted primary chemical stressor (e.g., PCBs) that could impact ecological receptors are creek sediment and floodplain soils. Ingestion of terrestrial and aquatic food items (e.g., invertebrates, fish, and other prey) is the most important exposure route for most upper-trophic level terrestrial and aquatic organisms. These concepts are illustrated in the exposure pathway diagrams for ecological receptors exposed to constituents present in sediment and soil (Figures 3 though 7). The figures illustrate the constituent sources, release mechanisms, exposure media, exposure pathways, exposure routes, and likely ecological receptors for major constituent groups (bioaccumulative substances – PCBs and methyl mercury, metals, SVOCs, VOCs, and OPs) potentially present at OUs 1, 2, and 3. The exposure model for each group is discussed below. The exposure pathway analysis in this SLERA is enhanced by explicitly considering the quality of habitats available in OUs 1, 2, and 3 to determine whether these areas have the capacity to retain a significant number of ecological receptors (see Section 3.3).

# 3.1.6.1 PCBs and Methyl Mercury

The exposure pathway diagram on Figure 3 illustrates the hypothetical links between the stressors (PCBs and methyl mercury) in sediment, surface water, surface soil, and prey and the potential ecological receptors. In aquatic systems, PCBs and methyl mercury readily adsorb onto sediments and may be transferred to aquatic organisms and to higher trophic levels. Methyl mercury and, especially, PCBs are found only in a dissolved state within the water column at very low concentrations (MacKay et al., 1992); organic matter in sediments provides the primary reservoir (NRC, 2001). PCBs and methyl mercury accumulate in aquatic organisms because of their high lipid solubility and slow rate of metabolism and elimination (MacKay et al., 1992). Although the transformation of PCBs in aquatic systems can occur via microbial degradation in aerobic surficial sediments, reductive dechlorination in anaerobic sediments, and the metabolic action of organisms that uptake PCBs, these processes are relatively slow and congener-specific (NRC, 2001). For example, less-chlorinated congeners are more likely to biodegrade than those containing a higher number of chlorine atoms. This causes

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the mixture composition of released PCBs to change over time in favor of the highly chlorinated congeners.

The latter tend to accumulate and biomagnify in biota (NRC, 2001).

Because PCBs and methyl mercury bioaccumulate in the food chain, these constituents are easily passed on to

organisms occupying higher levels in the food web (NRC, 2001). As a result, the potential exposure of

ecological upper-trophic level receptors to PCBs and methyl mercury in aquatic systems is primarily a function

of bioaccumulation, although some organisms, especially the benthos, are exposed via direct contact with or

ingestion of sediments or pore water.

For persistent, bioaccumulative compounds, the most significant route of exposure for higher-order organisms is

the ingestion of constituent-containing prey (Figure 3) (NRC, 2001). This exposure pathway is potentially

complete for organisms (e.g., fish and invertebrates) that obtain their food from Snow Creek and/or the

associated floodplain (Figure 3). Although sediment is considered the primary exposure medium for PCBs and

methyl mercury, the potential for floodplain soils to be washed into the aquatic system is also included in the

exposure pathway analysis. Exposure pathways from floodplain surface soil are potentially complete for

passerine birds, reptiles, amphibians, omnivorous mammals (e.g., raccoon or groundhog), raptors, and

carnivorous mammals.

Because PCBs and methyl mercury are generally not taken up through the root structure of plants and do not

accumulate in plants, plant uptake and the ingestion of plant tissue (both aquatic and terrestrial) are not

considered primary exposure pathways for these constituents.

3.1.6.2 Other Metals

Figure 4 depicts the exposure pathway diagram for ecological receptors exposed to metals. Metals in the

environment have complex behavior and fate. In water, soil, or sediment, metals undergo oxidation-reduction

reactions, ligand exchange, precipitation, and biotransformation. These processes are often controlled by ever-

changing oxidation-reduction potential, pH, sulfide ions, iron, temperature, and salinity and by the biota present.

The ultimate effect is that the prediction of metal fate and toxicity in a given medium can be a difficult process.

Accordingly, the exposure pathway analysis can complex, especially when generalizing for multiple metals.

However, one may adopt some general principles as the basis for identifying potential exposure pathways. For

example, compared to PCBs, metals can be far more soluble, and thus, more bioavailable to plants and biota for

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direct uptake. Also, unlike PCBs, metals can sorb and desorb from soil and sediment with equal ease, depending on the physical and chemical conditions at a particular site or moment in time. Furthermore, although most metals may be absorbed into plant or animal tissues, they generally do not biomagnify in higher trophic levels. Using these general observations, the conclusions described below can be made about the complete pathways for ecological receptors in OUs 1, 2, and 3 that are potentially exposed to metals.

Potentially complete exposure routes for aquatic macrophytes include direct contact with sediment and surface water. Macroinvertebrates have a high potential of exposure via direct contact with sediment and surface water, as well as via the ingestion of food (aquatic plants and invertebrates). Primary exposure routes for fish consist of ingestion of food (aquatic plants, invertebrates, other fish) and water, as well as direct contact with ambient water. Waterfowl may experience direct contact with surface water and may ingest aquatic or terrestrial plants, as well as aquatic invertebrates and water. Complete exposure pathways for metals may also be present for piscivorous birds ingesting water and fish. Piscivorous mammals have a similar exposure pathway potential, but they do not consume plants (Figure 4). Although terrestrial receptors show a lower frequency of complete pathways, each has at least one. Therefore, multiple ecological receptors in OUs 1, 2, and 3 have the potential to have at least one complete exposure pathway for metals.

### 3.1.6.3 Semivolatile Organic Compounds

As shown on Figure 5, there is some potential for compete exposure pathways to occur between aquatic and semi-aquatic organisms and SVOCs in sediment or surface water. Constituents such as dichlorobenzenes, chlorophenols, and nitrophenols can be present in either medium and can result in direct contact through incidental ingestion by a range of receptor organisms, including macrophytes, invertebrates, fish, birds, and mammals. However, the potential for exposure is minimal because SVOCs tend to readily dissipate in the environment, leading to reduced exposure potential. The potential for exposure (and complete exposure pathways) is also low for aquatic consumers of aquatic plant and animal prey. This is because any dichlorobenzenes, chlorophenols, and nitrophenols taken up are rapidly metabolized and excreted, resulting in low accumulation in prey tissues. This leads to low potential for exposure in predators. For the same reasons, the terrestrial receptors are also associated with low potential for exposure. Some SVOCs volatilize; therefore, these chemicals may be present in the air and higher-order receptors, such as amphibians, reptiles, birds, and mammals, may be exposed to SVOCs via direct contact with vapors and inhalation. However, given the remote

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and dated nature of the sources, the total contribution of this pathway to the overall exposure is considered insignificant.

### 3.1.6.4 Volatile Organic Compounds

VOCs are characterized by a considerable propensity to escape from dense environmental media, such as sediment, soil, and water. Moreover, these short-chain molecules tend to degrade relatively quickly once released into the environment. Therefore, these media are usually associated with a low potential for complete or significant exposure pathways where sources are no longer active or are removed from the immediate location of a receptor. Accordingly, Figure 6 shows the potential receptors as having incomplete or insignificant exposure pathways for this group of chemicals.

# 3.1.6.5 Organophosphorus Pesticides

OPs, such as parathion and sulfotepp, are less environmentally persistent than organochlorine insect control agents, such as dichlorodiphenyltrichloroethane (DDT). However, there is some potential for OPs to remain in various exposure media and to come into contact with ecological receptors. For example, methyl parathion tends to sorb to soil and may persist there for as long as two months (during fall, winter, and spring when sunlight levels are low). Persistence is measured in years in case of spills. OPs are soluble in water and, therefore, may be found in this exposure medium, as well as in soil and sediment. In aquatic systems, where the destructive action of sunlight (photolysis) may be limited, OPs may also persist long enough to affect receptors (although the absolute exposure period may be measured in days). Therefore, direct contact exposure pathways between sediment and aquatic receptors are potentially complete for those receptors that live in close proximity to sediment and tend to avoid direct sunlight (invertebrates, amphibians, and reptiles) (Figure 7). Because OPs are readily absorbed in biological tissues and subsequently stored in fat, some accumulation in prey may take place. For example, parathion is classified as having low to moderate bioaccumulation. As a result, there is a potential for complete exposure pathways between predators and prey (Figure 7). Breakdown of OPs in vegetation is rapid, so it is unlikely that herbivores would be exposed via the consumption of plants. For terrestrial systems, the species with potentially complete exposure pathways include soil invertebrates (e.g., earthworms) via direct contact, small burrowing mammals via ingestion of soil, and carnivorous mammals and birds via ingestion of prey. Volatilization of applied OPs is not considered extensive, so the air exposure medium was not included in the conceptual exposure model.

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3.1.7 Potential Receptors

While the natural environment in OUs 1, 2, and 3 has been significantly altered for residential, commercial, and

industrial uses, some habitat suitable for use by local ecological receptor populations may exist. However,

based on the information obtained from the habitat evaluations conducted in June 2005, potentially viable

habitats are few and isolated, and appear to have a limited capacity to support extensive wildlife communities.

The On-Facility exposure model presented in the RFI/CS Report (Golder, 2002) indicated that there were likely

few, if any resident ecological receptor populations potentially exposed to constituents detected within the

boundaries of the Facility area due to habitat restrictions. However, some birds and mammals were observed

within OU-3.

For the purpose of this SLERA, a single generic ecological receptor is considered that combines the

characteristics of all potentially exposed taxa. This is consistent with the explicit intent of the amended

guidance for ecological risk assessments (USEPA, 2000). A detailed exposure and risk analysis for

representatives of each feeding guild/taxon will be included, as necessary, in the BERA.

3.1.8 Assessment and Measurement Endpoints

According to USEPA guidance, assessment endpoints can be indicative of "any adverse effects on ecological

receptors, where receptors are plant and animal populations, communities, habitats, and sensitive environments"

(USEPA, 1997a). The assessment endpoint chosen for this screening level ecological risk assessment is the

desire for the generic ecological receptor foraging and reproducing in OUs 1, 2, and 3 to survive in a thriving

population. The measurement endpoints are the "measurable characteristics" that are used to evaluate the

identified assessment endpoint. For the generic ecological receptor, the measurement endpoints include adverse effects on survival, growth, and reproduction. Refined endpoints will be developed as necessary in subsequent

steps of the risk assessment process.

3.1.9 Ecological Effects Evaluation

Ecological screening values (ESVs), which are used to determine which substances detected in OUs 1, 2, and 3

might pose risk to resident ecological receptor populations, consist of ecological screening values for various

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media developed by USEPA Region 4 (USEPA, 2000). The ESVs used in this SLERA are presented on Tables

3 through 5.

3.2 Step 2: Screening Level Preliminary Exposure Estimate and Risk Calculation

As per USEPA guidance (1997a; 2000), screening level estimates of exposure and risk calculations use

assumptions that maximize the estimates of both exposure and risk to ensure that sites with potentially

unacceptable risk are not inappropriately eliminated from the assessment. The USEPA recommends that

maximum concentrations of constituents in each medium be compared to ESVs when conducting SLERAs. The

recommended approach is followed in this assessment.

3.2.1 Analytes Detected in Exposure Media

3.2.1.1 OU-1/OU-2

Constituent data from OU-1/OU-2 are available for the following exposure media: soil, Snow Creek sediments,

stormwater, and air. Air data will not be considered here because the results from the recently performed air

monitoring study (ENSR International, 2004) indicated that there are no fugitive air emissions that could lead to

a significant wildlife exposure pathway.

3.2.1.1.1 Soil

A substantial amount of soil sampling has been conducted in the residential and non-residential portions of OU-

1/OU-2 by both P/S and the USEPA. Sampling efforts have been conducted by P/S under the AOC and the

NTC removal agreements and by the USEPA as part of the CERCLA process for the Site. USEPA has also

collected samples in the area as part of investigations associated with the Anniston Lead Site, an unrelated

national priorities list (NPL) site sharing a similar geographical location. The current soil data set includes more

than 10,000 samples collected from locations spatially distributed across the entire geographic extent of OU-

1/OU-2 and analyzed by P/S and USEPA.

The results of the analyses of these thousands of soil samples are summarized as follows. Levels of total PCBs

in soil surface ranged from concentrations below the detection limit to 5,501 mg/kg. Levels of chlorobenzene

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reached a maximum of 0.0045 mg/kg. In addition to total PCBs and chlorobenzene, several metals were also detected in soil samples. Detected metals included arsenic, barium, beryllium, cadmium, chromium, cobalt,

lead, manganese, mercury, nickel, and vanadium. Arsenic was detected at a maximum concentration of 120 mg/kg, barium at a maximum concentration of 12,000 mg/kg, beryllium at a maximum concentration of 10

mg/kg, cadmium at a maximum concentration of 94 mg/kg, chromium at a maximum concentration of 14,000

mg/kg, cobalt at a maximum concentration of 390 mg/kg, lead at a maximum concentration of 19,000 mg/kg,

manganese at a maximum concentration of 11,000 mg/kg, mercury at a maximum concentration of 28 mg/kg,

nickel at a maximum concentration of 180 mg/kg, and vanadium at a maximum concentration of 150 mg/kg.

The identified maxima were used in the SLERA. Soil investigations also identified detectable levels of phenol;

however, this reported value was outside the limit of quantification.

3.2.1.1.2 Sediment

The characterization of sediment in Snow Creek was conducted in two phases. In Phase I, Snow Creek was visited on several occasions to collect samples and make visual observations in the stretch between the confluence with Choccolocco Creek and 11th Street Ditch. This was done for all areas of the creek with the exception of areas impeded by construction activities near the Quintard Mall and a short stretch in the vicinity of Sandy Creek Lumber Yard, for which no access was granted. The selection of deposits to sample for the Phase

II characterization was based on the distribution of sediment deposits along the creek and the type of sediment.

Since higher PCB levels were expected to be associated with fine-grained sediment deposits, these deposits were

selected for core collection.

A total of 111 samples from 50 cores were collected for laboratory analysis of PCB and total organic carbon (TOC). Approximately 10 samples were also submitted for the analysis of selected metals. In addition to these

deposits downstream of the 11th Street Ditch, 20 samples from 8 cores were collected from upstream of the 11th Street Ditch and submitted for metals analyses. Total PCB concentrations ranged from non-detect to 60 mg/kg.

Total PCB concentrations were generally higher in the upstream reaches of the creek and lowest throughout the

middle portion of the creek (from the railroad bridge to Highway 78).

The results of metal analyses of sediments collected in Snow Creek indicate the presence of arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, and vanadium at detectable

concentrations. Arsenic was detected at a maximum concentration of 21 mg/kg, barium at a maximum

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concentration of 410 mg/kg, beryllium at a maximum concentration of 2.0 mg/kg cadmium at a maximum

concentration of 3.3 mg/kg, chromium at a maximum concentration of 670 mg/kg, cobalt at a maximum

concentration of 26 mg/kg, lead at a maximum concentration of 140 mg/kg, manganese at a maximum

concentration of 2,400 mg/kg, mercury at a maximum concentration of 0.11 mg/kg, nickel at a maximum

concentration of 37 mg/kg, and vanadium at a maximum concentration of 64.0 mg/kg. The reported maxima

were used as inputs in the SLERA.

Limited sampling was also performed for the stormwater retention structure within the bounds of OU-1/OU-2.

Analysis of a single composite of five samples resulted in an estimated concentration for total PCBs of 1.14

mg/kg (J qualified). This result was included in the sediment database.

3.2.1.1.3 Stormwater

Surface water drainage from the Facility area (OU-3) to OU-1/OU-2 has been controlled through various

corrective actions. Actions taken before 1998 to control stormwater-mediated transport of COPCs to the Off-

Facility areas included the closure of the two landfills, the lining and re-routing of storm drains, collection of

stormwater runoff from the West End Landfill, construction of a stormwater management structure to collect

stormwater runoff from the South Landfill, diversion of stormwater runoff from unaffected areas upstream of

the South Landfill, re-piping of process-related water away from the stormwater drainage system to the waste

water treatment plant (WWTP) at the Facility, and installation of culverts for drainage through areas of impacted

soils (BBL, 2003). These measures have significantly reduced the discharge of COPCs into the stormwater

system. Data used in the SLERA were collected during and after 1998 and account for these activities.

As part of the On-Site RFI activities and NPDES permit requirements for the Facility, surface water runoff

samples were collected from several outfalls near the Facility and landfills that ultimately drain into

OU-1/OU-2. The outfalls sampled included DSN 001 through to DSN 009 and DSN 012. The analytes detected

included arsenic, barium, lead, manganese, methyl parathion, parathion, and total PCBs. Arsenic was detected

at a maximum concentration of 0.011 mg/L, barium at a maximum concentration of 0.036 mg/L, lead at a

maximum concentration of 0.035 mg/L, manganese at a maximum concentration of 0.2 mg/L, methyl parathion

at a maximum concentration of 0.012 mg/L, parathion at a maximum concentration of 0.015 mg/L, and total

PCBs at a maximum concentration of 0.0225 mg/L. These maximum reported values were used as inputs in the

SLERA.

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Chlorobenzene, dichlorobenzenes (1,2- and 1,4-), dichlorophenol (2,4-), nitrophenol (4-), pentachlorophenol,

phenol, sulfotepp, and tertrachloroethane (1,1,2,2-) were also detected in stormwater samples; however, these

detects were outside the limits of quantification.

3.2.1.2 OU-3

OU-3 constituent data are available for the following exposure media: soil, groundwater, and air. Soil and

groundwater data were collected during the RFI/CS conducted for the On-Facility area under the RCRA

program. Air data have been collected both in conjunction with RCRA investigation activities and

independently by the USEPA. Results for groundwater and air sampling will not be considered here because

these routes of exposure are either not available to ecological receptors or are of minor importance in driving

exposure and risk. Therefore, soil is the only medium that represents a potentially complete and quantitatively

significant exposure pathway.

3.2.1.2.1 Soil

RFI/CS activities conducted for the On-Facility area resulted in the collection of 15 surface (or near surface)

samples (including one duplicate) for metals. There were 41 surface (or near surface; including two duplicates)

samples collected for organic constituents from various locations across the On-Facility area. Based on these

results, the primary COPCs detected in surface soils at the Facility are arsenic, barium, beryllium, cadmium,

chromium, cobalt, lead, manganese, mercury, nickel, vanadium, and total PCBs. Several other substances were

analyzed for, but were not detected or confirmed in soil. Those included chlorobenzene, dichlorobenzenes (1,2-

and 1,4-), dichlorophenol (2,4-), nitrophenol (4-), trichlorophenols (2,4,5- and 2,4,6-), pentachlorophenol,

phenol, isopropyl benzene, methylene chloride, methyl parathion, parathion, triethylphosphorothioate,

Sulfotepp, and 1,1,2,2-tetrachloroethane.

The highest detected (and unqualified) total PCB concentration in a soil sample was 282 mg/kg in sample SSR-

09 from SWMU-7 (old Sanotar pit) (see Figure 39 for sampling locations). A concentration of 230 mg/kg PCB

was detected in sample SSR-07 in an adjacent management unit SWMU-6 (old "Phosphate" landfill). Because

both sites have been covered with gravel, no direct receptor exposures are expected. Three other samples, SSR-

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04, SSR-05, and SSR-15 contained relatively elevated levels of PCBs at 100, 110, and 463 J mg/kg,

respectively.

A J-qualified value of 13,400 mg/kg, which was an average of two samples, was reported for SSR-18, which is

located immediately downgradient from the former PCB production area. These two surface soil samples were

collected from under three inches of gravel that had been placed specifically to serve as a barrier to exposure.

The location has since been remediated with a concrete cap. Thus, it is unlikely that receptors would come into

a direct contact with soil containing the detected level of PCBs at that location.

The remaining soil samples contained relatively low concentrations of PCBs, all of which below the Site-

specific risk-based Tier 2 screening levels (BBL, 2003). This information suggests that the implemented

corrective and remediation actions at OU-3 have significantly reduced PCB levels at selected management units

and that any future risk assessment activities should focus on non-remediated locations.

Arsenic was detected at a maximum concentration of 14 mg/kg, barium at 780 mg/kg, beryllium at 1.0 mg/kg,

cadmium at 0.92 mg/kg, chromium at 48 mg/kg, cobalt at 74 mg/kg, lead at 220 mg/kg, manganese at 12,000

mg/kg, mercury at 1.4 mg/kg, nickel at 2,400 mg/kg, and vanadium at 93 mg/kg. These maxima were used as

inputs in the SLERA.

3.2.2 Data Handling and Post-Screening Procedures

Soil, sediment, and stormwater sampling yielded four types of data classified according to quality and

availability of screening benchmarks. The four data types are: 1) Detected - Unqualified, 2) Detected -

Qualified, 3) Undetected, and 4) No Toxicity Benchmark. The Detected - Unqualified category consists of all

data that were above detection and quantification limits, and did not have extraction difficulties or any other

quality control issues. The Detected - Qualified category includes all data that were typically above the method

detection limit, but below the limit of quantification (designation "J"). The Undetected category encompasses

all data that were not analytically detected (designation "U"). Finally, the No Toxicity Benchmark category

contains all data for which there are no ecological risk-based benchmarks (for soil, sediment, or stormwater), but

for which analytical results are reported. The following decision criteria are used to deal with each type of data

prior to proceeding with the SLERA.

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1. **Detected – Unqualified:** Use the highest detected concentration.

2. Detected - Qualified: Use the highest reporting limit.

3. Undetected: Use one-half detection limit.

4. No Toxicity Benchmark: Screen the substance through to the BERA.

For those instances where reporting and detection limits exceeded a screening benchmark, a conservative decision was made to retain that substance for further evaluation in the BERA.

3.2.3 Screening COPCs

The estimation of the screening risk level consists of comparing maximum concentrations of detected COPCs

found in soil, sediment, or stormwater to ESVs developed for these media.

OU-1/OU-2

Analysis of combined soil, sediment, and stormwater data (full detects; decision criterion 1) for OU-1/OU-2 in context of respective ESVs indicated that arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, manganese, mercury, nickel, vanadium, and total PCBs exceeded the screening criteria in at least one of the three media (Table 3). All of the data for a particular compound, whether unqualified or unqualified, were included in the screening step. Unqualified data were used preferentially for the screening assessment; however,

in all instances, if a qualified value exceeded a screening value, the particular analyte was retained as a COPC.

Analysis of qualified detects data (decision criterion 2) revealed that chlorobenzene, dichlorobenzenes (1,2- and 1,4-), dichlorophenol (2,4-), nitrophenol (4-), pentachlorophenol, phenol, sulfotepp, and tetrachloroethane

(1,1,2,2-) also exceeded soil, sediment, or water screening criteria (Table 3).

Examination of non-detect data (decision criterion 3) showed that the candidate COPCs could also include two trichlorophenols (2,4,5- and 2,4,6-) (Table 4). Finally, since there were no ESVs for methylene chloride, parathion, methyl parathion, isopropyl benzene, or triethylphosphorothioate (0,0,0-) in sediment or soil per

decision criterion 4, these COPCs were automatically forwarded to the BERA (Table 4).

OU-3

Analysis of full detect (decision criterion 1) soil data from OU-3 relative to ESVs indicated that arsenic, barium,

chromium, cobalt, lead, manganese, mercury, nickel, vanadium, and total PCBs exceeded their respective

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screening criteria (Table 5). Decision criterion 2 was not applied as there were no qualified results. The

following chemicals were not detected above the method detection limit (decision criterion 3): beryllium,

cadmium, dichlorobenzenes (1,2- and 1,4-), trichlorophenols (2,4,5- and 2,4,6-), dichlorophenol, nitrophenol

(4-), pentachlorophenol, and phenol. The maximum detected concentration for chlorobenzene was below the

screening value (Table 5).

Typically, unqualified data are used preferentially for the screening assessment. If an initial decision is made to

screen out a COPC using unqualified data, a second test is performed using qualified data to be certain that no

COPC is screened out in error. This second test did not apply in the analysis of data from OU-3 since there

were no qualified results.

Finally, there are no ESVs for methyl parathion, parathion, sulfotepp, triethylphosphorothioate (0,0,0-),

tetrachloroethane (1,1,2,2-), isopropyl benzene, or methylene chloride. As a result, per data screening criterion

4, all these compounds were included in the list of COPCs retained for the BERA even though these compounds

were not detected in measurable concentrations at the Facility. The chemicals that were carried through this

preliminary screening step are summarized in Table 5.

3.3 Exposure Pathway Analysis

The screening level problem formulation in Step I was based on conservative assumptions and did not take into

account Site-specific habitat information. In Step 2, Site-specific data were used to evaluate the completeness of

various exposure pathways. As an enhancement to that assessment, a detailed exposure pathway analysis was

undertaken to document the quality of habitat and species assemblages of OUs 1, 2, and 3. This enhanced

exposure pathways analysis provides information regarding the nature and distribution of active and complete

pathways in the context of the COPC assessment. This exposure pathways analysis begins with an overview of

the results of habitat and biological assessment investigations introduced in Section 3.1.2. Data sheets generated

during the field work are provided in Appendix A. A photographic log of the fish sampling effort is presented

in Appendix B.

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3.3.1 OU-1/OU-2 - Snow Creek and Stormwater Retention Structure

3.3.1.1 Habitat

As part of the RBP habitat assessment, a variety of habitat parameters in each of the five Snow Creek reaches

evaluated were assigned scores based on the condition of each particular parameter. An optimal habitat would

have received a score of 200. The results described below, ranged from a score of 121 (STA-2) to 130 (STA-4).

The selection of survey locations was purposefully biased toward the highest quality habitat locations, in

keeping with the conservative approach of this SLERA. Much of OU-1/OU-2 was not assessed because the area

is an urban corridor primarily comprised of industrial, commercial, and residential land uses that do not support

diverse, thriving ecological communities.

Station 1

The reach of Snow Creek designated as Station 1 was a run (100%) surrounded by residential land use. The

reach was partly shaded. The riparian zone was 12 to 18 meters wide and dominated by herbaceous plants

(clover). An emergent plant, Alligator weed, grew over approximately 35% of the creek bed.

Sand/gravel was the primary component of the Station 1 habitat type (60%). Cobbles and vegetated banks each

composed 20% (Figures 26 and 27 and Table 7). Under the RBP habitat assessment, only channel flow status

was given an optimal score. Pool substrate characterization, sediment deposition, and channel alteration were

categorized as suboptimal. With the exception of pool variability and channel sinuosity (characterized as poor),

all remaining parameters were found to be marginal. The total score for Station 1 was 122 (Table 8).

Station 2

Station 2 was primarily a run with some riffle areas (10%), and the reach was partly shaded. This portion of

Snow Creek was located in a residential area. The banks of the southern end of Station 2 were paved, where the

creek passed under a bridge. The riparian zone for the remainder of Station 2 was between 6 and 18 meters

wide, and dominated by grasses. No aquatic vegetation was observed.

Habitat type in Station 2 was equally divided between cobbles and sand/gravel (Figures 28 and 29 and Table 7).

The total score for the RBP habitat assessment at Station 2 was 121. Two parameters were scored as optimal

conditions: channel flow status and channel alteration. Epifaunal substrate/available cover was the only

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parameter ranked as suboptimal. While pool variability and the left bank's riparian vegetative zone width were

ranked as poor, all remaining parameters were observed as marginal (Table 8).

Station 3

The Station 3 reach consisted of half riffle and half run areas, and was partly open. A railroad track ran along

the western side of the creek and the reach was bordered by a combination of commercial and industrial land

use. The banks at the northern end of Station 2 were paved where the creek flowed under a bridge. The

remainder of the riparian zone was less than 6 meters wide, dominated by grasses mixed with some areas of

trees. No aquatic vegetation was observed.

Like Station 2, the habitat type of Station 3 was equally divided between cobbles and sand/gravel (Figures 30

and 31 and Table 7). The total score for the RBP habitat assessment was 124, and four parameters were ranked

as optimal: epifaunal substrate/available cover, sediment deposition, channel flow status, and channel alteration.

The rest of the parameters were ranked as marginal or poor (channel sinuosity and riparian vegetative zone

width) (Table 8).

Station 4

The Station 4 reach consisted of half riffle and half run areas, and was partly shaded. The station was bordered

by a combination of commercial and industrial land use. A box culvert carried discharge into Snow Creek in the

middle portion of the reach. A low flow into the creek was observed from the culvert. The riparian zone was

less than 12 meters wide and dominated by woody vegetation such as sycamore, willow, and privet. No aquatic

vegetation was observed.

Slight variation of habitat type was identified at Station 4 as 60% was identified as cobbles and 40% identified

as sand/gravel (Figures 32 and 33 and Table 7). Station 4 had the highest overall RBP habitat assessment score

of 130. Channel flow status and channel alteration were considered optimal. Three parameters were scored as

suboptimal: epifaunal substrate/available cover, pool variability, and sediment deposition. Significant points

came from parameters ranked as marginal. Only the riparian vegetative zone width was observed as poor (Table

8).

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Station 5

Station 5 consisted of riffle (25%), run (50%), and pool morphology (25%). This reach was located in a

commercial area. The riparian zone was less than 6 meters wide and dominated by trees such as sycamore,

mimosa, and willow. No aquatic vegetation was observed.

The greatest diversity in habitat type was observed in Station 5: 35% cobbles, 15% snag, 35% sand/gravel, and

15% bedrock outcrops (Figures 34 and 35 and Table 7). The overall score for the RBP habitat assessment at

Station 5 was 125. Three habitat parameters were observed under optimal conditions: epifaunal

substrate/available cover, sediment deposition, and channel flow status. Pool variability was the sole parameter

marked as suboptimal. While pool substrate characterization and riparian vegetative zone width were both

ranked as poor, the remaining parameters were marginal (Table 8).

Stormwater Retention Structure

The stormwater retention structure is located west of Snow Creek in a residential area. Approximately 60% of

its banks are vegetated. Vegetation documented at the stormwater retention structure includes approximately

30% cattail and 10% alligator weed around the perimeter of the pond (Figures 36 and 37). RBPs were not

conducted for the stormwater retention structure because the procedures and methods of scoring developed in

these protocols are not meant for, and do not accurately score, habitat within stormwater retention structures or

other similar artificial structures.

3.3.1.2 Biota

Benthic Macroinvertebrates

Results from the BMI sampling event are presented in Tables 9 through 14. The most abundant and diverse

collection of benthic macroinvertebrates was found in the stormwater retention structure, where no fish were

observed (Table 9). The retention structure samples contained a total of 331 macroinvertebrate specimens

representing 31 different taxa. The most abundant species was a mayfly (Callibaetis sp). There were 120

counted, composing 36.3% of the total sample. Damselfly (Enallagma sp.) (54 specimens) composing 16.3% of

the sample, and back swimmer (Notonecta indica) (36 specimens) composing 10.9% of the sample, were the

second and third most abundant species, respectively.

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On Snow Creek, the most abundant and diverse samples were found at Station 1 (Table 10) and Station 2 (Table

11). At Station 1, 97 specimens were collected composing a total of 19 different taxa. The top three species

counts consisted of: tubeworm (Limnodrilus sp.), 23 specimens (23.7%); damselfly (Ischnura sp.), 14 specimens

(14.4%); and midges (Thienemannimyia gr.), 12 specimens (12.4%). Station 2 had 13 different taxa for a total

specimen count of 106. A species of midge (Thienemannimyai gr.) was the most abundant at 42.5% (45

specimens) for Station 2. The second and third most abundant species at Station 2 were mayfly (Baetis sp.)

composing 25.5% (27 specimens) and caddisfly (Cheumatopsyche sp.) composing 16% (17 specimens) of the

total sample, respectively.

A decrease in specimen abundance and diversity was observed when the results from Stations 3, 4, and 5 were

compared to those from Stations 1 and 2. Only 16 specimens were counted at Station 3, composed of five

different taxa. Seven midges (Thienemannimyia gr.) composed 43.8% of the total sample (Table 12). Seven

different taxa representing 28 total specimens composed the total sample for Station 4, where 60.7% of the total

sample was composed of 17 midges (Thienemannimyia gr.) (Table 13).

Station 5 had two sample sets, 5A and 5B (Table 14). The first contained 16 specimens representing four

different taxa. Nine may flies (Baetis sp.) composed 56.3% of the total sample. Station 5 data set 5B contained

53 total specimens and 18 different taxa. In this set, 14 midge specimens (Thienemannimyia gr.) composed

26.4% of the total sample, while seven specimens of a different midge species (Ablabesmyia mallochi)

composed 13.2% of the total sample. A pouch snail species (Physa sp.) also composed 13.2% of the sample

with seven specimens.

Fish

Table 15 summarizes the results of the fish community sampling. Three taxa composed the 127 fish counted at

Station 1: largescale stoneroller (Campostoma oligolepis), eastern mosquitofish (Gambusia holbrooki) and

bluespotted sunfish (Enneacanthus gloriosus). Eastern mosquitofish was the dominant species with 110 total

specimens. Fifteen largescale stonerollers were counted at Station 1. This species was the dominant species for

the entire sampling length of Snow Creek.

At Station 2, 58 specimens representing five taxa were recorded. Largescale stoneroller was the highest species

count at 21 fish. The remaining four specimens included eastern mosquitofish, unknown shiner #1 (Notropis

sp.), unknown shiner #2 (Notropis sp.), and bluespotted sunfish. Six taxa representing 22 specimens were

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recorded at Station 3. The six species included largescale stoneroller, unknown shiner #1, unknown shiner #2,

unknown shiner #3, bluespotted sunfish, and creek chub (Semotilus atromaculatus). The eight unknown shiner

#2 represented the greatest sample count.

The largest fish count was recorded at Station 4, with 177 specimens and eight different species. Largescale

stoneroller was the most abundant fish with 70 specimens. Unknown shiner #2 was the second largest count

with 62 specimens. The remaining species included eastern mosquitofish, unknown shiner #1, bluespotted

sunfish, bluegill (Lepomis macrochirus), unknown shiner (Cyprinella sp.), and suckermouth minnow

(Phenacobius mirabilis).

Eight different species were also identified at Station 5 among 103 specimens. The largest fish count was again

largescale stoneroller with 91 specimens. The remaining species were represented by fewer than five specimens

each, and included unknown shiner #1, unknown shiner #2, bluespotted sunfish, unknown shiner (Cyprinella

sp.), longear sunfish (Lepomis megalotis), black redhorse (Moxostoma duquesnei), and yellow bullhead

(Ameiurus natalis).

No fish were observed or collected from the stormwater retention structure, and no fish collected in Snow Creek

were identified as threatened or endangered in the state of Alabama. A photographic log of the fish sampling

effort is presented in Appendix B.

Wildlife - Station Observations

Results from wildlife observations are presented in Table 16 Station 2 had the greatest diversity of avian and

mammalian species, while Station 1 had the greatest diversity of herpetiles and amphibians. The lowest level of

diversity observed was at Station 5.

At Station 1, ten avian species were observed. Barn swallows (Hirundo rustica), chimney swifts (Chaetura

pelgica), and tree swallows (Tachycineta bicolor) were all observed while foraging. Four species were noted

through calls: northern mockingbird (Mimus polyglottos), red-winged blackbird (Agelaius phoeniceus), robin

(Turdus migratorius), and yellow shafted flicker (Colaptes auratus). Both common grackles (Quiscalus

quiscula) and starlings (Sturnus vulgaris) were observed feeding, while a blue jay (Cyanocitta cristata) was

noted resting.

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Also observed at Station 1 were various mammalian and herpetile species. A muskrat (Ondatra zibethica) was

observed foraging on the bank. An unidentified species of bat (*Mycrotis* spp.) was observed in flight. Musk turtle (*Sternotherus odoratus*), Gulf Coast spiny softshell (*Apalone spinifera aspera*), and a cottonmouth

(Agkistrodon piscivours) were observed foraging. An American toad (Bufo americanus), a bull frog (Rana

(Agristrodon piscivours) were observed loraging. An American load (Bujo americanus), a buil flog (Rana

catesbeiana), a green frog (Rana clamitans melanota), and a southern leopard frog (Rana utricularia) were also

identified by sight and/or call. A crayfish burrow was identified on the upper bank of Station 1.

Station 2 had the greatest diversity of avian species. Species observed foraging or feeding included barn

swallow, Carolina chickadee (Parus carolinensis), common grackle, phoebe (Sayornis phoebe), robin, and tree

swallow. English house sparrows (Passer domesticus) and mourning doves (Zenaida macroura) were found

resting. Cardinal (Cardinalis cardinalis), gray catbird (Dumetella carolinensis), northern mockingbird, and

song sparrows were all noted through calls. Three species were noted while in flight: belted kingfisher (Ceryle

alcyon), rock dove (Columba livia), and starling. In addition, the tracks of cats (Felis domestica), dogs (Canis

domestica), and rats (Rattus norvegicus) were all observed within the bounds of Station 2. A muskrat burrow

and crayfish were also observed.

Station 3 wildlife tracks were restricted to observations of rats. Nine avian species were observed in some form

of activity. Barn swallows, brown thrashers (Toxostoma rufum), and chimney swifts were observed while

foraging. Cardinals, gray catbirds, and northern mocking bird were identified through calls. A belted kingfisher

was observed in flight and a starling was observed resting. A tree swallow in Station 2 was the only species in

all five reaches observed in a nest.

The least avian diversity existed at Station 4 with only four species: common grackle, northern mockingbird,

rock dove, and starling. Evidence of mammalian, herpetile, amphibian, and crustacean species were also

observed within the bounds of Station 4. Muskrat and rat tracks were observed, as were a Gulf Coast spiny

softshell, a copperhead, a southern two-line salamander, and crayfish.

Five avian species were noted at Station 5 along with herpetiles and crustaceans. Northern mockingbirds and

robins were both recorded through their calls. A starling was observed in flight and a barn swallow was

observed feeding. An English house sparrow was also noted. Both a Gulf Coast spiny softshell and copperhead

were observed as well as crayfish.

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At the stormwater retention structure, several species of wildlife were documented. Species included several

red-winged blackbirds nesting in the broadleaf cattail and dead/live black willow habitats, as well as barn

swallow, chimney swift, red-tailed hawk, and tree swallow. Also observed was a muskrat feeding station in the

broadleaf cattail habitat and a harvest mouse. Whitetail deer browse was noted on vegetation along the edge of

the stormwater retention structure, and a bull frog was identified by its call.

3.3.2 OU-3 (Facility and Landfill Areas)

3.3.2.1 Habitat

South Landfill

The South Landfill is a vegetated landfill cap that includes sampling areas identified as MFES, TGF, and LVF.

These areas were sampled along transect lines shown on Figure 38. In general, the primary habitats identified

throughout the three sampling areas of the South Landfill were vegetated fields containing various grass and

clover species. The percent vegetation cover observed in each sampling area was visually estimated and

recorded. Tables 17 and 18 summarize the results of the habitat characterization and vegetation survey.

The most northerly section of the South Landfill, MFES, was a mowed clover and grass field dominated by red

clover (Trifolium pretense) and white clover (Trifolium repens). The vegetation cover at this location was

approximately 100%. Other herbaceous species were also found in the field: common cinquefoil (Pontentilla

simplex), daisy fleabane (Erigeron annus), dogbane (Apocynum cannabinum), and English plantain (Plantago

lanceolata). A silk/mimosa tree (Albizia julibrissin) was also observed.

The centrally located sampling area of the South Landfill, TGF, was a tall grass field. The vegetation cover at

this location was approximately 100%, and composed of a mixture of grass species. Herbaceous species found

in this area included catbrier (Smilax glauca), common cinquefoil, dogbane (Apocynum cannabinum), curled

dock (Rumex crispus), daisy fleabane, pokeweed (Phytolacca Americana), red clover, white clover, grass and

crabgrass, and oat. Trumpet creeper (Campsis radicans), a vine, was also observed. Areas of disturbance were

noted in the TGF sampling area including vehicle tracks. These may be remnants of capping activities on the

former landfill.

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The final sampling area within the South Landfill, LVF, was a slender bush clover-dominated field. The

vegetation cover at this location was approximately 95% with the remaining 5% bare soil. The dominant

slender bush clover (Lespedeza virginica) left little room for other species. Those few included: curled dock,

dwarf raspberry (Rubus articus), and shrubby cinquefoil (Potentilla fruticosa). The early successional state of

the area was indicative of a recently capped, former landfill.

Open Area

In general, the primary habitats identified in the open area were a hardwood forest and an open area with low-

lying vegetation. The percent vegetation cover observed in the sampling area was visually estimated and

recorded. Tables 17 and 18 summarize the results of the habitat characterization and vegetation survey, and the

open area sampling location is identified as "OA" on Figure 38.

The open area was characterized by a hard-wood forest dominating 90% of the area. Trees included pecan

(Carya Illinoinensis), sweetgum (Liquidambar styraciflua), tree of heaven (Ailanthus altissima), turkey oak

(Quercus laevis), wild black cherry (Prunus serotina), and willow oak (Quercus phellos). No shrubbery was

present on the remaining 10% of the area. The open area was also characterized by low-lying vegetation on

approximately 80% of the area. These herbs included crabgrass (Digitaria spp.), silkgrass (Piyopsis spp.), and

white clover. Multiple vines were also observed: dewberry (Rubus flagellaris), poison ivy (Toxicodendron

radicans), and Virginia creeper (Parthenocissus quinquefolia). A shrub, privet (Ligustrum vulgare), was also

observed.

The average canopy height in the wooded area was between 40 and 50 feet. Low lying herbaceous vegetation

grew on the ground beneath it. The ground was also covered by filter fabric, which could present an obstacle for

burrowing animals, but 2-inch diameter burrows were noted in an intermittent stream corridor.

The sampling area was surrounded by open fields, roads, and buildings. It appeared that the area was intended

for use as a park for employees. The shrub layer had been removed and walking trails and picnic tables were

present. Disturbance in this would likely be from anthropogenic impacts.

Maintained Facility

In general, the primary habitat identified in the maintained facility (designated as sampling area CY) was a

clover field. This area was surrounded by buildings and roads. The percent vegetation cover observed in the

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sampling area was visually estimated and recorded. Tables 17 and 18 summarize the results of the habitat

characterization and vegetation survey, and the sampling transects are identified on Figure 38.

The maintained facility was dominated by a field of white clover. Other dominant herbaceous species in the

field included Bermuda grass (Cynodon dactylon), common dandelion (Taraxacum officinale), common

plaintain (Plantago major), crabgrass, and white clover. The vegetation covered 100% of the maintained

facility area. It also appeared that the maintained facility sample area was routinely mowed to about two to four

inches.

West End Landfill

In general, the primary habitat identified at the West End Landfill (designated as WLF) was a field composed of

herbs and grasses growing over the landfill cap. The percent vegetation cover observed in the sampling area

was visually estimated and recorded. Tables 17 and 18 summarize the results of the habitat characterization and

vegetation survey, and the sampling transects are identified on Figure 38.

The West End Landfill was 100% covered by herbs and grasses. Herbaceous species observed in the field

included common plantain, daisy fleabane, evening primrose (Oenothera biennis), goldenrod (Solidago spp.),

little bluestem (Schizachyrium scoparium), Queen Anne's Lace (Daucus carota), red clover, slender bush

clover, sweet yellow clover (Melilotus officinalis), upland boneset (Eupatorium sessilifolium), and white clover.

A vine, trumpet creeper, was also observed, as was a silk/mimosa tree and a wild black cherry tree.

The field showed indications of periodic mowing, and was at a height of 1 to 2 feet during field observations.

As its name indicates, the area was a former landfill, but is now capped and maintained. The vegetation present

was indicative of a recently disturbed area.

3.3.2.2 Biota

Soil/Grass Invertebrates

Results from this sampling event are presented in Table 19. The South Landfill had the greatest species

diversity and abundance of the four sample areas with 30 different taxa (32 when including the dogbane sweep).

Short-horned grasshoppers (family Acrididae) and crickets (family Gryllidae) were the most abundant in both

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the survey and sweep of the South Landfill. At the West End Landfill, a total of 12 different families were

noted with short-horned grasshoppers the most abundant. Out of 11 organisms collected from the open area, the

most abundant were black flies (family Simuliidae), with three individuals. Oligochaetes were the most

abundant organism from the maintained facility, comprising seven individuals of 11 in the sample.

Wildlife - Station Observations

The South Landfill was split into three sampling areas with three wildlife transects in each (Table 20). The most

northern is MFES where both mammals and birds were observed. Eight different species of birds and their

activities were noted. A barn swallow was observed foraging. Five species were observed perching: blue jay,

indigo bunting (Passerina cyanea), mourning dove (Zenaida macroura), northern mockingbird, and summer

tanager (Piranga rubra). Four species were noted in flight: cardinal, indigo bunting, northern mockingbird, and

an immature red-tailed hawk (Buteo jamaicensis). Deer tracks were observed in this area.

Various avian species were noted in the two remaining sections of the South Landfill, but no mammals were

observed. In the central area of the landfill, four avian species were observed in flight: mourning dove, red-

winged black bird, sparrow hawk (Falco sparverius), and summer tanager. The sparrow hawk was also

observed feeding at the most southern sampling area. Barn swallows, brown headed cowbirds (Molothrus ater)

and chimney swifts were observed in flight over the southern area, and sparrow hawks and red-winged

blackbirds were observed feeding.

At the open area (designated as SMF on the table), maintained facility (designated as CY on the table), and West

End Landfill, few species were observed (Table 20). No avian species were noted in the open area, but two-inch

burrows were observed in a small wet depositional area that were suspected to be from chipmunks (Tamias

striatus), squirrels, or armadillo (Dasypus novemcinctus). Meadowlark (Sturnella magna) and mourning dove

were seen perching at the maintained facility. Only meadowlarks were observed at the West End Landfill.

3.3.3 Habitat Quality Assessment

3.3.3.1 OU-1/OU-2

Habitat quality assessments for exposure pathways analysis were performed at five locations on Snow Creek

and near the stormwater retention structure. All habitats in these areas were disturbed, and only fragments of

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vegetated habitats remain in the urbanized environment along Snow Creek. Habitat remnants in these areas were typically narrow, and altered by mowing, clearing, or development of parking lots, roadways, or rail infrastructure. Using the KPM described in Section 3.1.2.1, these narrow vegetated habitat remnants were assigned ratings substantially below what would be awarded to an undisturbed woodland that represents "climax" conditions in the area (see the column titled "KP Value Score" in Table 6). Scores were generally low due to limited structural quality, low diversity, dominance of non-native and invasive species, and intrusive levels of disturbance. In addition, the overall landscape is impacted by development.

The area around the stormwater retention structure has large areas of moved fields that provide poor wildlife habitat, but the landscape in this area does include a mix of habitat types, including patches of more diverse vegetation of several kinds. As a result, the area ranks relatively high on the KPM scale, even though overall habitat conditions in OU-1/OU-2 are generally poor.

Because the Site-specific KPM score does not reflect the overall quality of the landscape and the highly isolated condition of the habitat remnants surveyed, as described in Section 3.1.2.1, the KP Value Scores presented in Table 6 were modified. Specifically, we applied a Site-specific interspersion factor of -1.0 to account for the fact that the areas adjacent to the habitats surveyed were primarily developed/impacted land. This modification extends the KPM and makes it applicable in the land use matrix along Snow Creek and in OU-3. The application of this interspersion category is reflected in the column titled "Modified KP Value Score" in Table 6, and that modified score was used to assign the "Adjusted Habitat Quality Rating" shown on Table 6.

#### 3.3.3.2 OU-3

The habitat characteristics of four areas were evaluated in OU-3, including the open area, maintained facility, the West End Landfill, and the South Landfill. In general the habitat quality of these areas was poor, reflecting maintenance activities (cutting and mowing), low plant diversity, and poor soil conditions. The low diversity of herbaceous vegetation and the lack of woody vegetation resulted in fairly low scores across the OU (see the column titled "KP Value Score" in Table 6). The only exception was the employee park (the open area), which supports nature trails through a forested area. The KP Value Score of 5.25 earned it a "fair" ranking, and even after applying the Site-specific interspersion factor of -1.0, the area still falls into the "fair" category. This employee park is highly disturbed by daily activities and is actively maintained. As a result, this isolated area of more diverse habitat is not a focus for exposure due to the daily disturbance and ongoing maintenance activities.

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# 4. Uncertainty

In each step of the ecological risk assessment process, assumptions must be made that are based on professional judgment in the absence of concise scientific data, and every assumption introduces some degree of uncertainty into the risk assessment process. In a SLERA, the conservative assumptions that are made throughout the process are included in an effort to sufficiently protect ecological receptors and ensure that potential risk, if identified, is evaluated further. When all of the assumptions are added together, it is much more likely that the risks are overestimated rather than underestimated. The approach is consistent with USEPA guidance (USEPA 1997a). Specific points of uncertainty in the SLERA for OUs 1, 2, and 3 are as follows:

- Selection of Constituents. First, the COPCs considered originated from a previously defined list of COPCs, rather than from an analysis of the universe of substances from comprehensive sampling scans. While it is possible that by using this approach some substances may have been omitted, the probability of omitting critical compounds associated with the Facility is low. This is because the original list of COPCs was prepared after extensive consultations between the Facility operators and various regulatory agencies. Some of these constituents are not suspected to persist or bioaccumulate in higher trophic level organisms (e.g., barium, beryllium, cobalt, manganese, nickel, vanadium) and occur only infrequently in samples at the Site. Second, the frequency of detection was not accounted for in the COPC screening process as a conservative measure to ensure that the list of COPCs retained for the BERA included any compound potentially significant from a risk perspective. The magnitude of uncertainty associated with the potential that analytes critical to the determination of ecological risk may have been incorrectly omitted is low, and in fact insignificant from a risk assessment perspective. Nevertheless, in future sampling efforts, a subset of samples will be evaluated for a wide range of chemical constituents to confirm previous findings and provide information relevant to the ASM process.
- Potential Pathways and Routes of Exposure. By ensuring that the exposure assessment is conservative, the effects assessment and preliminary risk characterization will be inherently conservative as well. In this SLERA, maximum concentrations for each COPC were assumed to be representative of exposure point concentrations for ecological receptors. However, ecological receptors are more likely to be exposed to a range of COPC concentrations some of which will be well below the maximum detected value as well as some media where COPCs are not present. The latter point is particularly notable for areas in OU-3 that have been remediated and capped with clean soils. Furthermore, it is unlikely that of

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the ecological receptors observed in OU-1/OU-2, any one receptor (or community) would forage exclusively at the Site and be exposed to chronic levels of COPCs.

- Effects Evaluation. The primary uncertainty associated with the ecological effects evaluation in this SLERA is the selection of benchmarks for comparison with maximum concentrations of Site constituents. The benchmarks considered in this SLERA were from sources that incorporate specific approaches in the methods used to derive a concentration that is protective of ecological receptors. For example, ORNL documents (Efroymson et al., 1997a and b) were used to derive soil benchmarks presented in the USEPA (1997a) guidance. The ORNL authors readily acknowledge that there is some level of uncertainty associated with their derivation methodology. This uncertainty stems from the fact that most of the studies used to derive the soil benchmarks were laboratory-controlled dose studies that artificially increase the bioavailability of constituents to organisms so that a response can be detected. However, and in accordance with the conservative nature of the SLERA process, the authors also acknowledge that the soil benchmarks selected are sufficiently conservative to protect organisms at the community level (Efroymson et al., 1997a and b). This situation is the same for the benchmarks considered for the other media considered in this SLERA.
- Preliminary Exposure Estimate and Risk Calculation. As per USEPA's (2000) guidance, screening level estimates of exposure and risk calculations use assumptions that maximize the estimate of risk to ensure that only those chemicals that represent a de minimis risk are eliminated from further consideration, and those that potentially pose an unacceptable risk will be retained for consideration in subsequent steps of the assessment. The comparison of maximum concentrations of constituents in each medium to ESVs is a conservative approach to minimize this type of uncertainty (Type II error).
- Exposure Pathway Analysis. Uncertainties in the exposure pathway analysis are biased conservatively. Habitat characterizations were made at the highest quality habitat present in each location, reflecting the highest quality habitat in the area as a whole. In nearly all cases, the assessments were conducted in small patches of extant habitat in a landscape lacking such habitats, or, in the case of OU-3, in a landscape of managed lands similar to the assessment location. Additional quantitative evaluation of exposure pathways via receptor and habitat analysis would yield substantially fewer estimates of complete pathways and identify poorer quality habitat.

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5. Conclusions

This SLERA employs a conservative evaluation methodology (USEPA, 2000). Use of this approach in the SLERA for OUs 1, 2 and 3 (Steps 1 and 2) revealed that several metals, OPs, VOCs, SVOCs (including total PCBs and specific PCB homologues and congeners), PAHs, and PCDD/PCDFs require investigation in a BERA (see Tables 3 through 5). The application of risk assessment guidance (USEPA, 1997a) in a subsequent step (Step 3), as well as the collection of new data and information, may lead to the refinement of the list of COPCs. As noted in the Phase I CSM Report (BBL, 2003), these COPCs, including PCBs, metals, OPs, VOCs, and SVOCs are present throughout the Anniston area and are associated with a range of potential sources, including the relocation of dredged sediment, the placement of foundry fill, and other industrial activities in the Choccolocco Creek watershed. As discussed earlier, an ASM approach will be applied to the continued evaluation of COPCs for the Site. This process will include an evaluation of the data to refine the list of COPCs. This refinement process could lead to the addition or deletion of COPCs based on the data collected.

To supplement the identification of COPCs and the application of the ASM process, a screening assessment of exposure pathways was conducted using aquatic and terrestrial habitat evaluation results. This screening level exposure pathways assessment incorporated direct measures of habitat quality and receptor distribution. This is in keeping with the specifications in USEPA's ecological risk assessment guidance (1998) for evaluation of "measures of ecosystem and receptor characteristics," and with the Superfund ecological risk assessment guidance (USEPA, 1997a) that specifies a pathways analysis in the screening assessment problem formulation step. Applied here in the screening phase, the pathways assessment provides a basis for focusing the BERA on appropriate receptors and ecosystem components as well as COPCs identified through toxicological screening and further application of the process.

An exposure pathway assessment based on the aquatic and terrestrial habitat investigations is provided in Table 21. This table shows that terrestrial exposure pathways throughout OUs 1, 2, and 3 are truncated and incomplete. Habitat throughout is disturbed; dominated by mowed and maintained lands with low-habitat quality plant cover, impervious surfaces, and transportation infrastructure. Development pressure is strong in OU-1/OU-2, and over time remaining terrestrial habitat fragments will likely be subject to increasing disturbance as more urban infrastructure is constructed.

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In contrast, aquatic ecosystems in Upper Snow Creek (above Highway 78), while disturbed and of generally low quality, do support complete exposure pathways. Based on the conservative assumptions applied in this SLERA, the aquatic exposure pathways in Snow Creek and associated COPCs will be evaluated in a BERA (see Table 21). The BERA for Snow Creek will be coordinated with BERA activities planned in OU-4, such that relevant investigations and findings of OU-4 activities will be applied to the assessment of Snow Creek.

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**Tables** 

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# TABLE 1 COMMON PLANT AND WILDLIFE SPECIES OBSERVED IN RESIDENTIAL AND NON-RESIDENTIAL HABITATS

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON, ALABAMA

Trees	Herbaceous	Shrubs				
Acer negundo (Box-elder, FACU) Acer rubrum (Red Maple, FAC) Acer saccharinum (Silver Maple, FACW) Allanthus altissima (Tree of Heaven, NL) Albizia julibissim (Silk Tree, NL) Asimina triloba (Common Pawpaw, FAC) Betula populifolia (Gray Birch, FAC) Carya glabra (Sweet Pignut Hickory, FACU-) Carya tomentosa (Mockernut Hickory, NL) Comus florida (Flowering Dogwood, FACU-) Fraxinus quadrangulata (Blue Ash, NL) Juglans nigra (Black Walnut, FACU) Juniperus virginiana (Eastern Red Cedar, FACU) Liquidambar styraciflua (Sweetgum, FAC) Magnolia virginiana (Sweetbay, FACW+) Morus rubra (Red Mulberry, FACU) Paulowina tomentosa (Princess Tree) Platanus occidentalis (Sycamore, FACW-) Quercus phellos (Willow Oak, FAC+) Quercus prinus (Chestnut Oak, UPL) Quercus rubra (Red Oak, FACU-) Rhus glabra (Smooth Sumac, NL) Robinia pseudo-acacia (Black Locust, FACU-) Salix exigua (Sandbar Willow, OBL)	Ambrosia artemisiifolia (Common Ragweed, FACU) Ambrosia trifida (Great Ragweed, FACU) Apocynum cannabinum (Clasping-leaf Dogbane, FACU) Aster vimineus (Small White Aster, NL) Conyza canadensis (Canada Horseweed, UPL) Cyperus strigosus (Straw-color Flat Sedge, FACW) Daucus carota (Queen-Annes Lace, NL) Erigeron annuus (White-top Fleabane, FACU) Eupatorium perfoliatum (Common Boneset, FACW+) Helenium tenuifolium (Fine-leaved Sneezeweed, NL) Juncus effusus (Soft Rush, FACW+) Lespedeza virginica (Slender Bush Clover, NL) Oenothera biennis (Evening Primrose, FACU-) Oxalis montana (Wood Sorrel, FAC-) Panicum virgatum (Switchgrass, FAC) Phytolacca americana (Pokeweed, FACU+) Plantago lanceolata (English Plantain, NL) Plantago major (Common Plantain, FACU) Polygonum hydropiperoides (Swamp smartweed, OBL) Solidago gigantea (Late Goldenrod, FACW) Thelypteris noveboracensis (New York Fern, FACW) Trifolium repens (White Clover, FACU-) Typha latifolia (Common Cattall, OBL)	Gaylussacia sp. (Huckleberry, NS) Ligustrum vulgare (European Privet, FACU) Rhus copallinum (Dwarf Sumac, NL) Rhus copallinum (Winged Sumac, NI) Rosa multiflora (Multiflora Rose, FACU) Vaccinium angustifolium (Lowbush Blueberry, FACU-) Vaccinium corymbosum (Highbush Blueberry, FACW) Viburnum acerifolium (Maple-leaved Viburnum, UPL)  Grasses Dichanthelium clandestinum (Deer-tongue witchgrass, FAC+) Eulalia viminea (Nepal Microstegium, FAC) Leesia oryzoides (Rice Cutgrass, OBL) Phalaris arundinacea (Reed Canary Grass, FACW+) Schizachyrium scoparium (Little Bluestem, FACU-) Setaria glauca (Yellow Foxtail, FAC) Eustachys petraea (Finger Grass, FACU-)  Vines  Campis radicans (Trumpet-creeper, FAC) Humulus lupulus (Common Hop, FACU) Lonicera japonica (Japanese Honeysuckle, FAC-) Smilax rotundiflolia (Greenbrier, FAC) Toxicodendron radicans (Poison Ivy, FAC)				
Salix nigra (Black Willow, OBL) Sassafras albidum (Sassafras, FACU-) Ulmus americana (American elm, FACW-)	Verbena bonariensis (South Americam Vervain, FAC+)	Pueraria montana (Kudzu, NL)				
Birds	Herptiles	Insects				
Cyanocitta cristata (Common bluejay) Turdus migratorius (American robin) Stumus vulgaris (Common Starling) Melospiza melodia (Song sparrow) Melanotis sp. (Mockingbird) Cuculus sp. (Cuckoo) Zenaida macroura (Mourning dove) Poecile carolinensis (Carolina chickadee) Sitta carolinensis (White breated nuthatch) Ardea herodias (Great blue heron) Columba livia (Rock dove) Riparia riparia (Bank swallow) Cardinalis cardinalis (Red cardinal) Sialia sp. (Bluebird) Quiscalus quiscula (Common grackle)	Rana clamitans (Green frog)	Coenagrionidae (Damselfiles) Corixidae (Water boatmen) Gryllidae (Common cricket)				

Note: 1) The following are the wetland classification for the individual species

2) A negative sign (-) indicates a species less frequently found in wetlands. A positive sign (+) indicates a species more frequently found in wetlands (Reed 1986).

OBL-A plant species that is generally (>99% of the time) found only in wetlands under natural conditions. FACW-A plant species that usually (>66% to 99% of the time) is found in wetlands, but which may be found occasionally in uplands under natural conditions.

FAC-A plant species that sometimes (>33% to 66% of the time) is found in wetlands, but which may also be found commonly in uplands.

FACU-A plant species that is seldom (<33% of the time) found in wetlands and that usually occurs in uplands. UPL-A plant species that is generally (>99% of the time) found only in uplands under natural conditions. NI-Currently no agreement as to indicator status.

NC-A plant species not classified (recent additions to indicator list).

NL-A plant species not listed.

NS-A plant that has been identified to only Genus.

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# TABLE 2 COMMON WILDLIFE SPECIES OBSERVED IN RESIDENTIAL AND NON-RESIDENTIAL HABITATS

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# SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON PCB SITE, ANNISTON, ALABAMA

Birds Add Add Add Add Add Add Add Add Add A	Herptiles	Insects
Cyanocitta cristata (Common bluejay)	Rana clamitans (Green frog)	Coenagrionidae (Damselflies)
Turdus migratorius (American robin)	The second of the second secon	Corixidae (Water boatmen)
Sturnus vulgaris (Common Starling)		Gryllidae (Common cricket)
Melospiza melodia (Song sparrow)		
Melanotis sp. (Mockingbird)		
Cuculus sp. (Cuckoo)		
Zenaida macroura (Mourning dove)		
Poecile carolinensis (Carolina chickadee)		
Sitta carolinensis (White breated nuthatch)		
Ardea herodias (Great blue heron)		
Columba livia (Rock dove)		
Riparia riparia (Bank swallow)		
Cardinalis cardinalis (Red cardinal)	스타를 받는다면 하는 사람들이 되었다.	
Sialia sp. (Bluebird)		
Quiscalus quiscula (Common grackle)		

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TABLE 3
SUMMARY OF SCREENING RESULTS FOR CONSTITUENTS DETECTED IN SOIL, SEDIMENT, AND STORMWATER (OU-1/OU-2)

# SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON, ALABAMA

Constituents		Soil					Sediment				Stormwater			
	Units	Max Conc.	Max EQL	ESV <sub>soil</sub>	ESV <sub>soil</sub> Exceeded?	Max Conc.	Max EQL	ESV <sub>sed.</sub>	ESV <sub>sed</sub> , Exceeded?	Max Conc.	Max EQL	ESV <sub>water</sub>	ESV <sub>water</sub> Exceeded?	
					Full	Detects								
Arsenic	ppm	120		10	Yes	21		7.24	Yes	0.011		0.190	No	
Barium	ppm	12,000		165	Yes	410		NA	NA	0.036		NA	NA	
Berylium	ppm	10		1.1	Yes	2.0		NA	NA	NA		0.00053	NA	
Cadmium	ppm	94		1.6	Yes	3.3		1.0	Yes	NA		0.00066	NA	
Chromium	ppm	14,000		0.4	Yes	670		52.3	Yes	NA		0.011	NA	
Cobalt	ppm	390		20	Yes	26		NA	NA	NA		NA	NA	
Lead	ppm	19,000		50	Yes	140		30.2	Yes	0.035		0.00132	Yes	
Manganese	ppm	11,000		100	Yes	2,400		NA	NA	0.2		NA	NA	
Mercury	ppm	28		0.1	Yes	0.11		0.13	No	NA		0.000012	NA	
Nickel	ppm	180		30	Yes	37		15.9	Yes	NA		0.0877	NA	
Vanadium	ppm	150		2.0	Yes	64		NA	NA	NA		NA	NA	
Chlorobenzene	ppm	0.0045		0.05	No	NA		NA	NA	NA		0.195	NA	
Total PCBs	ppm	5,501		0.02	Yes	60		0.033	Yes	21.9		0.000014	Yes	
Merthyl parathion	ppm	NA		NA	NA	NA		NA	NA	0.012		NA	NA	
Parathion	ppm	NA		NA	NA	NA		NA	NA	0.015		0.000013	Yes	
					Qualifie	ed Detect	s							
Chlorobenzene	ppm		NA	0.05	NA			NA	NA		5	0.195	Yes	
Dichlorobenzene (1,2-)	ppm		NA	0.01	NA			NA	NA		10	0.0158	Yes	
Dichlorobenzene (1,4-)	ppm		NA	0.01	NA			NA	NA		10	0.0112	Yes	
Nitrophenol (4-)	ppm		NA	7.0	NA			NA	NA		50	0.0828	Yes	
Dichlorophenol (2,4-)	ppm		NA	20	NA			NA	NA		10	0.0365	Yes	
Pentachlorophenol	ppm		NA	0.002	NA			NA	NA		50	0.013	Yes	
Phenol	ppm		1.2	0.05	Yes			NA	NA		10	0.256	Yes	
Sulfotepp	ppm		NA	NA	NA			NA	NA		0.5	NA	Yes	
Tetrachloroethane (1,1,2,2-)	ppm		NA	NA	NA			NA	NA		5	0.240	Yes	

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# TABLE 3

SUMMARY OF SCREENING RESULTS FOR CONSTITUENTS DETECTED IN SOIL, SEDIMENT, AND STORMWATER (OU-1/OU-2)

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON, ALABAMA

#### Notes:

Max. Conc. – Maximum detected concentration Max. EQL – Maximum method quantification limit ESV<sub>soil</sub> – Ecological screening value for soil ESV<sub>sed.</sub> - Ecological screening value for sediment ESV<sub>water</sub> - Ecological screening value for water NA-not available

**Anniston PCB Site** Screening Level Ecological Risk Assessment for Operable Units 1, 2, and 3 **Revision: 1** 

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### TABLE 4

SUMMARY OF SCREENING RESULTS FOR CONSTITUENTS NOT DETECTED IN OU-1/OU-2 SOIL, SEDIMENT, OR STORMWATER FOR WHICH THERE ARE NO ENVIRONMENTAL SCREENING VALUES

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON PCB SITE, ANNISTON, ALABAMA

Constituents		A SHARE	Soil		STEEL LEE	Sedime	ent .	Stormwater			
	Units	1/2 MDL	ESV <sub>soil</sub>	ESV <sub>soil</sub> Exceeded?	1/2 MDL	ESV <sub>sed.</sub>	ESV <sub>sed.</sub> Exceeded?	1/2 MDL	ESVwwater	ESV <sub>water</sub> Exceeded?	
				No	n Detects						
Trichlorophenol (2,4,5-)	mg/kg	235	4.0	Yes	NA	NA	NA	25	NA	NA	
Trichlorophenol (2,4,6-)	mg/kg	1,250	10	Yes	NA	NA	NA	5	0.0032	Yes	
				No E	Benchmar	k					
Methylene chloride											
Methyl parathion											
Isopropyl benzene											
Triethylphosphorot	hioate (o,o,c	)-)									

#### Notes:

1/2 MDL - Highest 1/2 detection limit

ESV<sub>soil</sub> - Ecological screening value for soil

ESV<sub>sed.</sub> - Ecological screening value for sediment ESV<sub>water</sub> - Ecological screening value for water

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## TABLE 5 RESULTS OF SCREENING LEVEL ECOLOGICAL ASSESSMENT FOR OU-3

# SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON PCB SITE, ANNISTON, ALABAMA

	Maximum Detected Concentration	1/2 Detection Limit	Units	ESV <sub>soil</sub>	Units	ESV <sub>soll</sub> Exceeded?
		Full Detec	ts		NAMES OF STREET	
Arsenic	14		mg/kg	10	mg/kg	Yes
Barium	780		mg/kg	165	mg/kg	Yes
Berylium	1.0		mg/kg	1.1	mg/kg	No
Cadmium	0.92		mg/kg	1.6	mg/kg	No
Chromium	48		mg/kg	0.4	mg/kg	Yes
Cobalt	74		mg/kg	20	mg/kg	Yes
Lead	220		mg/kg	50	mg/kg	Yes
Manganese	12,000		mg/kg	100	mg/kg	Yes
Mercury	1.4		mg/kg	0.1	mg/kg	Yes
Nickel	2,400		mg/kg	30	mg/kg	Yes
Vanadium	93		mg/kg	2.0	mg/kg	Yes
Total PCBs	282		mg/kg	0.02	mg/kg	Yes
		Qualified D	ata			
Berylium		3.0	mg/kg	1.1	mg/kg	Yes
Cadmium		3.0	mg/kg	1.6	mg/kg	Yes
Chlorobenzene		0.00335	mg/kg	0.05	mg/kg	No
Dichlorobenzene (1,2-)		19	mg/kg	0.01	mg/kg	Yes
Dichlorobenzene (1,4-)		19	mg/kg	0.01	mg/kg	Yes
Nitrophenol (4-)		95	mg/kg	7.0	mg/kg	Yes
Trichlorophenol (2,4,5-)		19	mg/kg	4.0	mg/kg	Yes
Trichlorophenol (2,4,6-)		19	mg/kg	10	mg/kg	Yes
Dichlorophenol		19	mg/kg	0.01	mg/kg	Yes
Pentachlorophenol		95	mg/kg	0.002	mg/kg	Yes
Phenol		19	mg/kg	0.05	mg/kg	Yes
		No Benchn	nark			
Methyl Parathion Parathion Sulfotepp Triethylphosphorothioate (0,0,0-) Tetrachloroethane (1,1,2,2-) Isopropyl benzene Methylene chloride						

ESV<sub>soil</sub> – Ecological screening value for soil (US EPA 2000)

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#### TABLE 6 TERRESTRIAL WILDLIFE HABITAT EVALUATION SUMMARY

#### SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON PCB SITE, ANNISTON, ALABAMA

Location	Habitat Type	Evaluation Key	KP Optimum Habitat Score	KP Value Score (1)	Site-Specific Interspersion Factor <sup>(2)</sup>	Modified KP Value Score	Adjacent Habitat	Adjusted Habitat Quality Rating (3)
OU-1/OU-2								
SC-1 East Bank	Mowed Field	Odd Area	10	3.0	-1.0	2.0	Residential development and a park	Poor
SC-1 West Bank	Mowed Field	Odd Area	10	2.5	-1.0	1.5	Residential homes and roads	Poor
SC-2 East Bank	Narrow (30-ft) riparian corridor	Odd Area	10	2.5	-1.0	1.5	Residential development	Poor
SC-2 West Bank	Narrow (30-ft) mowed field	Odd Area	10	2.0	-1.0	1.0	Residential development and road ditches	Poor
SC-3 East Bank	Narrow (20-ft) upland	Woodland	10	4.75	-1.0	3.75	Abandoned construction yard	Fair
SC-3 West Bank	Narrow (10-ft) riparian upland	Woodland	10	3.75	-1.0	2.75	ROW	Poor
SC-4 East Bank	Narrow (20-ft) steep slope	Odd Area	10	4.0	-1.0	3.0	15-ft wide mowed area adjacent to a parking lot	Poor
SC-4 West Bank	Junkyard	Woodland	10	5.25	-1.0	4.25	No access	Fair
SC-5 East Bank	Narrow (10-ft) railroad ROW	Woodland	10	4.5	-1.0	3.5	Railroad line	Fair
SC-5 West Bank	Narrow (10-ft) forest edge	Woodland	10	4.5	-1.0	3.5	Parking lot	Fair
Stormwater Retention Structure	Mowed Field	Odd Area	10	5.0	0.0	5.0*	Mature forest, open water, and a wetland	Fair
OU-1/OU-2 Average				3.9		2.9		Poor
OU-3		- AMSTERN					Vitoria de la companya del companya de la companya del companya de la companya de	
Open Areas	Park Area	Woodland	10	5.25	-1.0	4.25	Park area with trails, benches, and tables	Fair
Maintained Areas	Mowed Field	Odd Area	10	1.0	-1.0	0.0	Mowed grass	No Rank
West End Landfill	Landfill	Odd Area	10	3.0	-1.0	2.0	Landfill	Poor
South Landfill	Mowed Field	Odd Area	10	2.0	0.0	2.0*	Mowed fields with low vegetative diversity; mature forest border	Poor
OU-3 Average				2.7		2.1		Poor

#### Notes:

- 1- The KP Value Score is the habitat quality score resulting from the characteristics of the highest quality habitats in the evaluation area.
- 2- A site-specific interspersion factor was developed and applied to the KP Value score to account for the developed, urban nature of the land use bordering Snow Creek.
- 3- The Adjusted Habitat Quality Rating is the qualitative ranking of habitat quality reflected by the Modified KP Value score. Scores that fall within established ranges in the KP Method are ranked as follows:

	KP Value Score range	Rank
15	1.0 - 3.0	poor
	3.1 - 5.5	fair
	5.6 - 7.9	good
	8.0 - 10.0	excellent

<sup>\* -</sup> Denotes a location where no modification of the KP Value Score was applied.

## TABLE 7 BENTHIC MACROINVERTEBRATE COMMUNITY SURVEY DATA SUMMARY— SNOW CREEK

December 2005

Habitat Type	A SOLL PRINCIPLE OF SER	P	ercentage of Habitat	by Location	<b>义是的证明以及</b>
riabitat Type	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5
Cobble	20	50	50	60	35
Snag					15
Vegetated Banks	20				
Sand/gravel	60	50	50	40	35
Submerged Aquatic Vegetation					
Bedrock outcrops					15
A STATE OF THE STA	Biof	Recon - Distribution	of Sampling Effort		
Habitat Type	CONTRACTOR	CA WATER AND AN	lumber of Jabs/Kick	per Habitat	STATE OF THE STATE
Fabilial Type	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5
Cobble	1	2	2	2	1
Snag					1
Vegetated Banks	1				
Sand/gravel	2	2	2	2	1
Submerged Aquatic Vegetation					
Bedrock outcrops					1
Other -					
Be	enthic Invertebrate C	Community Assess	ment - Distribution of	Sampling Effort	
	PROLENCE AND SERVE		lumber of Jabs/Kick		The second second
Habitat Type	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5A/5B*
Cobble	4	10	10	12	8
Snag					3
Vegetated Banks	4				2
Sand/gravel	12	10	10	8	9
Submerged Aquatic Vegetation					
Bedrock outcrops					2
Other - detritus/leaf litter					2

<sup>\* -</sup> distribution of jabs among samples SC-STA-5A and SC-STA-5B, additional jabs collected to adequately characterize the range of habitat type present

## TABLE 8 RAPID BIOASSESSMENT PROTOCOL HABITAT ASSESSMENT SUMMARY

December 2005

Habitat Parameters - Low Gradient	Condition Catergory & Score Optimal (20 - 16) Suboptimal (15 - 11) Marginal (10 - 6) Poor (5 - 0)							
Streams Reaches	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5			
Epifaunal Substrate/Available Cover	8	11	17	12	17			
Pool Substrate Characterization	14	8	7	8	4			
Pool Variability	3	4	8	11	15			
Sediment Deposition	14	12	17	14	17			
Channel Flow Status	17	17	17	17	18			
Channel Alteration	14	17	18	18	9			
Channel Sinuosity	5	6	3	4	6			
Bank Stability								
Right Bank (10 - 0)	9	9	7	10	10			
Left Bank (10 - 0)	9	9	10	10	10			
Vegetative Protection								
Right Bank (10 - 0)	9	9	7	10	9			
Left Bank (10 - 0)	8	8	10	9	. 7			
Riparian Vegetative Zone Width								
Right Bank (10 - 0)	6	6	1	5	2			
Left Bank (10 - 0)	6	5	2	2	1			
TOTAL SCORE	122	121	124	130	125			

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### TABLE 9 BENTHIC MACROINVERTEBRATE DATA STORMWATER RETENTION STRUCTURE

POR PROPERTY AND PROPERTY.		Sample Location:	Station RP-01		
The Alice		Sample Date: Sample Type:	13-Jun-05 Kick Net		
faxon:		Sample Type.	Common Name	Number	Percent
Rhyncobde	llida				ONLAND
tily 1100 b d c	Glossiphon	niidae			
		Helobdella papillata	leech	2	0.6%
Hydrachnic	tia				
	Limnesiida	e			
		Limnesia sp.	mite	13	3.9%
Ephemero					
	Baetidae				
	0	Callibaetis sp.	mayfly	120	36.3%
	Caenidae	Cassis as	mouthy	3	0.9%
Odonata	-	Caenis sp.	mayfly	3	0.9%
Ouomata	Aschnidae				
	Ascillidae	Aeschna sp.	dragonfly	8	2.4%
	-	Anax sp.	dragonfly	1	0.3%
	Coenagrior				
		Fnallagma sp	damselfly	54	16.3%
	Libellulidae	e (early instar)	dragonfly	10.00	0.3%
		Erythemis simplicollis	dragonfly	3	0.9%
Hemiptera					
	Belostoma				
	0.111	Belostoma sp.	giant water bug	4	1.2%
	Corixidae				0.00/
		Hesperocorixa sp.	water boatman	1	0.3%
	0	Sigara sp.	water boatman	2	0.6%
-	Gerridae	Comis on	water strider	2	0.6%
	Mesoveliid	Gerris sp.	water strider	2	0.0%
	iviesoveilid	Mesovelia mulsanti	water treader	6	1.8%
	Naucoridae		water treater	0	1.076
	Ivadcondac	Pelocoris femoratus	creeping water bug	9	2.7%
	Notonectid		Crooping Hater bug		
		Notonecta indica	back swimmer	36	10.9%
Coleoptera			NE RECORDE DE COMPANION DE L'ANNOUNCE DE L'ANNOUNCE DE L'ANNOUNCE DE L'ANNOUNCE DE L'ANNOUNCE DE L'ANNOUNCE DE		
	Dytiscidae			A STATE OF THE CONTRACTOR	
		llybius sp.	diving beetle	5	1.5%
	Haliplidae				
		Haliplus sp.	crawling water beetle	2	0.6%
		Peltodytes sp.	crawling water beetle	1	0.3%
	Hydrophilic				2 22/
		Berosus sp.	scavenger beetle	1	0.3%
	Noteridae	Tropisternus sp.	scavenger beetle	22	6.6%
	Noteridae	Hydrocanthus sp.	burrowing water beetle	1	0.3%
Diptera		Tryurocaninus sp.	bullowing water peetle		0.370
Diptora	Ceratopog	onidae			
	Josianopog	Palpomyia gr.	biting midge	4	1.2%
19. 4119	Chaoborida		,g		
		Chaoborus punctipennis	phantom midge	1	0.3%
	Chironomic	dae			
		Cricotopus bicinctus	midge	1	0.3%
		Endochironomus nigricans	midge	6	1.8%
		Larsia sp.	midge	10	3.0%
		Parachironomus chaetoalus	midge	5	1.5%
	Culielder	Paratanytarsus sp.	midge	1	0.3%
	Culicidae	Culov on	morguito	-	1.5%
	Stratiomylic	Culex sp.	mosquito	5	1.5%
	Suadoniyili	Odontomyia sp.	soldier fly	1	0.3%
		Total Number of Specimens	Soluter try	331	100.0%
	-	Total Number of Taxa		31	100.076

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### TABLE 10 BENTHIC MACROINVERTEBRATE DATA STATION 1

"Constitution of the	S SPACE AND LOS	Sample Location:	Station SC-1	Visit Avade and Alex	A HOUSE COME	
經經濟學的	P TEMPERATURE	Sample Date:	10-Jun-05	<b>主体主义的基础的现在分</b>	<b>产。在他的外部</b>	
<b>"这种政治,不可能</b>	20 公司国际政党国际设计	Sample Type:	Kick Net	る。土地は、政府を発行しは	20世紀 5世紀 30年	
Taxon:	11 ランドルドル はままり	19 of 19 19 19 19 19 19 19 19 19 19 19 19 19	Common Name	Number	Percent	
Tubificida						
	Tubificidae					
		Bothrioneurum vejdovskyanum	tubeworm	1	1.0%	
		Branchiura sowerbyi	tubeworm	3	3.1%	
		llydrilus templetoni	tubeworm	1	1.0%	
		Limnodrilus sp.	tubeworm	23	23.7%	
Basommator						
	Ancylidae					
		Ferrissia rivularis	limpet snail	3	3.1%	
	Lymnaeidae					
		Fossaria sp.	pond snail	3	3.1%	
	Physidae					
		Physa sp.	pouch snail	9	9.3%	
Veneroida						
	Sphaeriidae					
		Pisidium sp.	pill clam	3	3.1%	
Decapoda						
	Cambaridae					
		Orconectes sp.	crayfish	1	1.0%	
Odonata						
	Aschnidae					
		Aeschna sp.	dragonfly	6	6.2%	
	Coenagrionidae					
		Enallagma sp.	damselfly	7	7.2%	
		Ischnura sp.	damselfly	14	14.4%	
Coleoptera						
	Haliplidae					
		Peltodytes sp.	crawling water beetle	1	1.0%	
Diptera						
	Chironomidae					
MILE DE LES		Chironomus sp.	midge	1	1.0%	
		Natarsia sp.	midge	3	3.1%	
		Phaenopsectra obedians gr.	midge	3	3.1%	
		Stictochironomus sp.	midge	2	2.1%	
		Tanypus sp.	midge	1	1.0%	
		Thienemannimyia gr.	midge	12	12.4%	
		Total Number of Specimens		97	100.0%	
		Total Number of Taxa		19		

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### TABLE 11 BENTHIC MACROINVERTEBRATE DATA STATION 2

Contract Contract	45 E 1 E 1 E 1 E 1	Sample Location:	Station SC-2	901C460CAN	<b>编数数数数据</b>
		Sample Date:	10-Jun-05		
10 CH	<b>"我是是这个</b> 是是	Sample Type:	Kick Net	444	
Taxon:	<b>は、日本の大学の大学の大学</b>	The transfer of the second section is a second seco	Common Name	Number	Percent
Tubificida		FZ-45-S-Mile Sept. C			
	Tubificidae				
		Bothrioneurum vejdovskyanum	tubeworm	3	2.8%
		Limnodrilus sp.	tubeworm	1 .	0.9%
Arhyncobdellida					
	Erpobdellidae				
		Mooreobdella sp.	leech	1	0.9%
Basommatophor	a				
	Physidae				
		Physa sp.	pouch snail	1	0.9%
	Planorbidae				
		poss. Planorbella sp. (tent.)	orb snail	1	0.9%
Ephemeroptera					
	Baetidae				
		Baetis sp.	mayfly	27	25.5%
Odonata					
	Coenagrionidae				
		Ischnura sp.	damselfly	1	0.9%
Trichoptera					
	Hydropsychidae				
		Cheumatopsyche sp.	caddisfly	17	16.0%
Coleoptera				<b>国际</b> 。图 555	
	Elmidae				
		Stenelmis crenata gr.	riffle beetle	6	5.7%
Diptera					
	Ceratopogonida	e			
		Atrichopogon sp.	biting midge	1	0.9%
	Chironomidae				
		Cryptochironomus fulvus gr.	midge	1	0.9%
		Thienemannimyia gr.	midge	45	42.5%
	Empididae				
		Hemerodromia sp.	dance fly	1	0.9%
		Total Number of Specimens		106	100.0%
		Total Number of Taxa		13	

## TABLE 12 BENTHIC MACROINVERTEBRATE DATA STATION 3

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		Sample Location:	Station SC-3		CONTRACTOR OF STREET
Free paragraph of the		Sample Date:	10-Jun-05	La company de la company	
(17) (4) 伊克斯斯(3)	5 SAL 22 CALL PAGE	Sample Type:	Kick Net	- 10 Marie 10 10 10 10 10 10 10 10 10 10 10 10 10	
Taxon:	TO SERVICE AND A POST	TORRESPONDE DESCRIPTION OF THE PROPERTY OF THE	Common Name	Number	Percent
Lumbricina					
	Lumbricidae				
		Eiseniella tetraeidra	earthworm	1	6.3%
Basommatophora					
	Physidae				
		Physa sp.	pouch snail	1	6.3%
Ephemeroptera					
	Baetidae				
		Baetis sp.	mayfly	3	18.8%
Diptera					
	Chironomidae				
		Orthocladius sp.	midge	4	25.0%
		Thienemannimyia gr.	midge	7	43.8%
		Total Number of Specimens		16	100.0%
		Total Number of Taxa		5	

## TABLE 13 BENTHIC MACROINVERTEBRATE DATA STATION 4

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Carlotte Car		Sample Location:	Station SC-4	Application of the	
	THE RESERVE	Sample Date:	10-Jun-05	Storik Mades	11.514.425
	<b>李林林林林林</b>	Sample Type:	Kick Net	<b>建筑在1000000000000000000000000000000000000</b>	ACCUSED NO
Taxon:			Common Name	Number	Percent
Basommatopho	ora				
	Physidae				
		Physa sp.	pouch snail	1	3.6%
Ephemeroptera					
	Baetidae				
		Baetis sp.	mayfly	3	10.7%
Trichoptera					
	Hydropsych				
		Cheumatopsyche sp.	caddisfly	1	3.6%
Diptera					0.0%
	Chironomida	ae			
		Ablabesmyia mallochi	midge	1	3.6%
		Orthocladius nigritus	midge	1	3.6%
		Orthocladius sp.	midge	4	14.3%
		Thienemannimyia gr.	midge	17	60.7%
		Total Number of Specimens		28	100.0%
		Total Number of Taxa		7	

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### TABLE 14 BENTHIC MACROINVERTEBRATE DATA STATION 5

THE PLANT OF STREET		Sample Location:	Station SC-5	<b>第一个大型等</b>		40	
行物的政治等的	<b>《</b>	Sample Date:	10-Jun-05	<b>分文。生兴森</b>			
extension and the	<b>经工程的基础的</b>	Sample Type:	Kick Net		<b>是为自由生</b>	图5000年1965	
TO STATE	STATE OF THE STATE	<b>新</b> 上三十分数数元的第三人称形式	2 为他自己的关心和外对的		-5A	SC	-5B
Taxon:		Service Control of the Control of th	Common Name	Number	Percent	Number	Percent
umbricina	PROPERTY OF STREET						
	Lumbricidae		earthworm			1	1.9%
Tubificida				Dr. English			TO HELD
	Tubificidae						
		Limnodrilus sp.	tubeworm	1	6.3%		0.0%
Mesogastropoda	a						
	Hydrobiidae			Market State			
		poss. Fontigens sp. (tent.)	dusky snail			1	1.9%
Basommatopho	ra						
	Lymnaeidae						
		Stagnicola sp.	pond snail			1	1.9%
	Physidae						
		Physa sp.	pouch snail			7	13.2%
	Planorbidae						
		poss. Planorbella sp. (tent.)	orb snail	THE STATE OF		2	3.8%
phemeroptera							
	Baetidae						
		Baetis sp.	mayfly	9	56.3%	1	1.9%
Trichoptera							
	Hydropsychidae						
		Cheumatopsyche sp.	caddisfly	1	6.3%	1	1.9%
Coleoptera							
Diptera							
	Chironomidae						
		Ablabesmyia mallochi	midge			7	13.2%
		Chironomus sp.	midge			1	1.9%
		Cricotopus bicinctus	midge		Land Carlot	1	1.9%
		Cricotopus/Orthocladius sp.	midge	Me dele		1	1.9%
		Dicrotendipes sp.	midge			1	1.9%
		Orthocladius sp.	midge			2	3.8%
		Phaenopsectra obedians gr.	midge			6	11.3%
		Polypedilum tritum	midge			4	7.5%
		Thienemannimyia gr.	midge	5	31.3%	14	26.4%
	Tipulidae						
		Limonia sp.	crane fly			1	1.9%
		Limonia canadensis	crane fly			1	1.9%
MARKET LABOR.		Total Number of Specimens		16	100.0%	53	100.0%
		Total Number of Taxa		4		18	

## TABLE 15 FISH COMMUNITY SURVEY DATA SUMMARY

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## SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON PCB SITE, ANNISTON, ALABAMA

Species Observed	Production States		ount by Locati	on		Total Fish	
Species Observed	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	10(a) F 1811	
Largescale Stoneroller (Campostoma oligolepis)	15	21	2	70	91	199	
Eastern Mosquitofish (Gambusia holbrooki)	110	2		7		119	
Unknown Shiner #2 (Notropis spp.)		5	8	62	3	78	
Unknown Shiner #1 (Notropis spp.)		12	3	23	4	42	
Bluespotted Sunfish (Enneacanthus gloriosus)	2	18	1	5	1	27	
Unknown Shiner #3 (Notropis spp.)			7			7	
Bluegill (Lepomis macrochirus)				6		6	
Unknown Shiner (Cyprinella sp.)				3	1	4	
Creek Chub (Semotilus atromaculatus)			1			1	
Suckermouth minnow (Phenacobius mirabilis)				1		1	
Longear Sunfish (Lepomis megalotis)					1	1	
Black Redhorse (Moxostoma duquesnei)					1	1	
Yellow Bullhead (Ameiurus natalis)					1	1	
Total Fish	127	58	22	177	103	487	
# Taxa	3	5	6	8	8		
Total Shock Time (seconds)	2,386	2,146	1,468	1,678	2,322	10,000	
Catch per unit Effort	0.053	0.027	0.015	0.105	0.044	0.049	

<u>Note</u>: Results of the RP-1 fish survey are intentionally omitted from this table - no fish were observed during 1,700 seconds of shocking in the stormwater retention structure

December 2005

#### TABLE 16 WILDLIFE OBSERVATION SUMMARY

### SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON, ALABAMA

		STATE OF THE PARTY	Carrier 1	Observation		。 1.	
Common Name	Scientific Name	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	SRS
Birds							
Barn swallow	Hirundo rustica	FG	FG	FG		FE	FG
Belted Kingfisher	Ceryle alcyon		FL	FL			
Blue jay	Cyanocitta cristata	RS					
Brown Thrasher	Toxostoma rufum			FG			12
Cardinal	Cardinalis cardinalis		CA	CA			
Carolina chickadee	Parus carolinensis		FG				6.05
Chimmey Swift	Chaetura pelgica	FG		FG	BOVER DESIGNATION		FG
Common grackle	Quiscalus quiscula	FE	FG		FL		
English house sparrow	Passer domesticus		RS			RS	
Gray catbird	Dumetella carolinensis		CA	CA			
Mourning dove	Zenaida macroura		RS				
Northern mockingbird	Mimus polyglottos	CA	CA	CA	CA	CA	
Phoebe	Sayomis phoebe		FG				
Red-Tailed Hawk	Buteo jamaicensis				No.	Barrier II	FG
Red-winged blackbird	Agelaius phoeniceus	CA					CA
Robin	Turdus migratorius	CA	FE			CA	
Rock dove	Columba livia		FL		FL		
Song sparrow	Melospiza melodia	The second	CA				
Starling	Sturnus vulgaris	FE	FL	RS	FG	FL	
Tree swallow	Tachycineta bicolor	FG	FG	NE			FG
Yellow shafted flicker	Colaptes auratus	CA					
Mammals	STATE CHARLES	<b>经</b> 经历的一种	The state of the s	1988年至	<b>国际企业</b>	12	Corolles.
Cat	Felis domestica		TR				
Dog	Canis domestica		TR				
Harvest Mouse	Reithrodontomys humulis						FG
Muskrat	Ondatra zibethica	FG	DHB		TR		FG
Rat	Rattus norvegicus		TR	TR	TR		
Bat	No. of the least o	FL					
Herptiles	不是不是一种的一种的人。	<b>经</b>	为2年7月1年6月	Balletin School	Will Street	<b>松村</b> 华、李宝堂	PERSONAL PROPERTY.
Musk turtle	Sternotherus odoratus	FG					
Gulf Coast Spiny Softshell	Apalone spinifera aspera	FG			ОВ	OB	
Copperhead	Agkistrodon contortix				FG	RS	
Cottonmouth	Agkistrodon piscivours	FG					
Amphibians		日本 は 日本 は 日本	PHRICES A	生产的企业工作	San	A CONTRACTOR	2020年
American Toad	Bufo americanus	OB					
Bull Frog	Rana catesbeiana	CA					CA
Green Frog	Rana clamitans melanota	CA					
Southern Leopard Frog	Rana utricularia	CA					
Southern Two-lined Salamander	Eurycea cirrigera				ОВ		
Crustaceans	以及中国的中国 (1995年) · · · · · · · · · · · · · · · · · · ·	<b>产业企业的</b>	· Contract Contract	<b>建筑的</b>	A PER CANADA		
Crayfish		DHB	OB		OB	OB	

FL=Flight

SL=Slide

Wildlife Observation Codes: CA=Calling SC=Scat CA=Calling FG=Browse/Forage NE=Nest DHB=Den, Hut, Burrow

FG=Foraging TR=Tracks OB=Observed

FE=Feeding DB=Day bed RS=Resting/Perching

SRS: Stormwater retention structure

December 2005

## TABLE 17 HABITAT OBSERVATION SUMMARY

	MFES	TGF	LVF	OÁ	CY	WLF
Primary Habitat	Mowed clover and grass field.	Tall Grass Field	Lespedeza Field	Forested	Clover Field	Mowed field
Cover Type & %	100% vegetation cover	100% vegetation cover	95% Vegetative Cover, with 5% bare areas	90% tree coverage, No habitat present on 10% of the area. Open area 80% vegetated with herbs and grasses.	100% cover by herbs (clover)	100% vegetation cover
Dominant Vegetation, Density & Height	red & white clover		slender bush clover	40' to 50' average canopy height in wooded area. Herb vegetation	White clover, common plaintain, common dandelion, & crabgrass, mowed to 2"-4"	1' to 2' tall field,with a mix of herbs and grasses.
Surrounding Habitats & Land Use	Landfill cap and forested	Landfill cap and forested	Landfill cap and forested	open fields, roads, and buildings	buildings, roads	landfill cap
ndications of	recently mowed	Vehicle tracks observed.	routinely mowed		routinely mowed	periodic mowing
Other observations	No signs of burrows runs or trails.	No signs of non- avian wildlife were observed.	No signs of non- avian wildlife were observed.	Much of the ground is covered by filter fabric which will limit burrowing. Shrub layer has been removed and trails and picnic tables present. 2" diameter burrows were noted in an intermitent stream corridor are a possible armadillo dig area, a nest (potentially squirrel) in a tree was observed.	No signs of non-avian wildlife were observed.	No signs of non-avian wildlife were observed.

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#### TABLE 18 VEGETATION SUMMARY

		South Landfill (SL)			Open Area	Maintained Facility	West En
		MFES		LVF	SME	CY CY	WLE
Grasses & Herbs	The Children Markey and Children			E-SECTION OF			
bermuda grass	Cynodon dactylon					X	
catbrier	Smilax glauca		X				
common cinquefoil	Potentilla simplex	X	X				
common dandelion	Taraxacum officinale					X	
common plaintain	Plantago major					X	X
crabgrass (spp)	Digitaria spp.		X		X	X	
curled dock	Rumex crispus		X	X			71.50
daisy fleabane	Erigeron annus	X	X				X
dogbane	Apocynum cannabinum	X	X				
English plantain	Plantago lanceolata	X					
evening primrose	Oenothera biennis						X
goldenrod, spp.	Solidago spp.					620 Ka 0 676	X
grass (spp)	Various species		X	NEW THE			
little bluestem	Schizachyrium scoparium					75	X
oat (spp)	Various species		X				
pokeweed	Phytolacca americana		X				
Queen Anne's lace	Daucus carota	1 1 1 1 1 1 1 1 1 1					X
red clover	Trifolium pratense	X	X				X
silkgrass	Pityopsis spp.			E1 16/01	X		
slender bush clover	Lespedeza virginica			X			X
sweet yellow clover	Melilotus officinalis						X
upland boneset	Eupatorium sessilifolium			2022			X
white clover	Trifolium repens	X	X		X	X	X
Vines	The state of the s	S BALLANTAN	Constitution in	Company of the Compan	N. M. M. S.		
dewberry	Rubus flagellaris	and the second second second			X		
dwarf raspberry	Rubus articus			X			
poison ivy	Toxicodendron radicans				X		
trumpet creeper	Campsis radicans		X		- ^		X
Virginia creeper	Parthenocissus quinquefolia				X		
Shrubs		di settata di secolaria	Three States and the	Walter Training		3057 48 77	high white
privet	Ligustrum vulgare			St. Math. Co. St. W.	X		CHOKARCIN CHONIE
shrubby cinquefoil	Potentilla fruticosa			Х			
Trees	AND THE STREET STREET,	The state of the s	為种质质		THE PERSON	(6)	We like
silk/mimosa tree	Albizia julibrissin	X					X
pecan	Carya Illinoinensis				X		
sweetgum	Liquidambar styraciflua				X		
ree of heaven	Ailanthus altissima				X		
urkey oak	Quercus laevis				X		
wild black cherry	Prunus serotina				X		X
villow oak	Quercus phellos	-			X		^

December 2005

#### TABLE 19 TERRESTRIAL INVERTEBRATES SUMMARY

Family	Common Name	Number of Individuals
1000年,2000年,1900年,1900年	South Landfill (SL)	The same of the sa
Acrididae	Short-Horned Grasshoppers	2
Anisopodidae	Wood Gnats	
Braconidae Carabidae	Braconids	
	Ground Beetles	
Cecidomyiidae	Gall Gnats	
Cephidae Chrysomelidae	Stem Sawflies Leaf Beetles	
Chrysopidae	Green Lacewings	
Cynipidae	Cynipids	
Flea unidentified <sup>1</sup>		
	Flea - unspecified	
Formicidae	Ants	
Gryllacrididae	Camel Crickets	5
Gryllidae	Crickets	5
Hemiptera nymph unidentified <sup>1</sup>	Bugs - unspecified	
Hydrometridae	Water Measurers	
Hydropsychidae	Net-Spinning Caddisflies	
Hymenopteran nymph unidentified1	Sawflies/Ants/Wasps/Bees/Chalcids - unspecified larvae	
Lepidopteran unidentified <sup>1</sup>	Butterflies/Moths - unspecified	
Millipede unidentified <sup>1</sup>	Millipede	
Miridae	Leaf/Plant Bugs	
Nabidae	Damsel Bugs	
Oligochaeta	Oligochaete	
Phloeothripidae	Tube-Tailed Thrips	
Rhopalidae	Scentless Plant Bugs	
Saldidae	Shore Bugs	
Simuliidae	Black Flies	
Sphecidae	Sphecid Wasps	
Spider	Spider	
Spider unidentified <sup>1</sup>	Spider	
Tick unidentified <sup>1</sup>	Tick	
Tingidae	Lace Bugs	
Wolf spider	Spider	EST MANY DESIGNATIONS
	West End Landfill (WEL)	STATE OF STATE OF STATE OF STATE OF
Acrididae	Short-Horned Grasshoppers	
Chrysomelidae	Leaf Beetles	
Coccinellidae	Ladybird Beetles	
Dipteran nymph unidentified <sup>1</sup>	Fly nymph - unspecified	
Dytiscidae	Prdeaceous Diving Beetles	
Mantidae	Mantids Decides	
Membracidae	Treehoppers	
Millipede unidentified <sup>1</sup>	Treeneppers	1
Oligochaeta	Oligochaete	
Pulicidae	Common Flea	
Saldidae	Shore Bugs	
Spider unidentified <sup>1</sup>		
opider unidentined	Spider	
Corombusidos	Open Area (OA)	
Cerambycidae	Long-Horned Beetles	
Dipteran nymph unidentified <sup>1</sup>	Fly nymph - unspecified	
Formicidae	Ants	
Gryllidae	Crickets	
Mantidae	Mantids	
Simuliidae	Black Flies	
Spider unidentified <sup>1</sup>	Spider	
STATE SECURIOR STATE	Maintained Facility (MFG)	(1) 200 年(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)
Chironomidae	Midges	
Coleopteran larvae unidentified <sup>1</sup>	Beetle larvae - unspecified	
Dytiscidae	Prdeaceous Diving Beetles	
Oligochaeta	Oligochaete	

Notes:

1 Organisms listed as "unidentified" could not be identified in the field with the available microscope, investigators needed higher power lens to see body parts.

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#### TABLE 20 WILDLIFE OBSERVATION SUMMARY

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3 OF THE ANNISTON PCB SITE ANNISTON, ALABAMA

	<b>有关的人类的人的人类的人类的人类的人类的人类的人类的人类的人类的人类的人类的人类的人</b>		Observation Location						
Common Name	Scientific Name	South	Maintaine SMF	d Facility	West End Landfill WLF				
Birds	S PERSONAL PROPERTY OF THE	THE PARTY OF THE PARTY.					100000000000000000000000000000000000000		
Barn swallow	Hirundo rustica	FG		FL			Control of the Contro		
Belted Kingfisher	Ceryle alcyon				Tennes de				
Blue jay	Cyanocitta cristata	RS							
brown headed cowbird	Molothrus ater			OB					
Brown Thrasher	Toxostoma rufum					Berthall Bridge	1		
Cardinal	Carlinalis cardinalis	FL					10000		
Carolina chickadee	Parus carolinensis								
Chimney Swift	Chaetura pelgica			FL			The		
Common grackle	Quiscalus quiscula								
English house sparrow	Passer domesticus								
Gray catbird	Dumetella carolinensis						TEACH IN		
Indigo bunting	Passerina cyanea	FL/RS							
Meadowlark	Sturnella magna					RS	RS		
Mourning dove	Zenaida macroura	RS	FL	07-196		RS			
Northern mockingbird	Minus polyglottos	FL/ RS		The same					
Phoebe	Sayomis phoebe								
Red-Tailed Hawk	Buteo jamaicensis	FL (immature)							
Red-winged blackbird	Agelaius phoeniceus		FL	FE					
Robin	Turdus migratorius								
Rock dove	Columba livia		Killer III						
Song sparrow	Melospiza melodia						G TO E T		
Sparrow Hawk (Kestrel)	Falco sparverius		FG/FL	FE					
Starling	Sturnus vulgaris								
Summer Tanager	Piranga rubra	RS	FL						
Tree swallow	Tachycineta bicolor				250				
Yellow shafted flicker	Colaptes auratus						0.00		
Mammals	的 美国民主要的特殊的特别的企业	医医 自然的 经营产品	· 中国 数据 图 元			Office Ass	1000000		
Armadillo	Dasypus novemcinctus				DHB				
Chipmunk	Tamias striatus				DHB				
Deer (spp)		TR							
Squirrel (spp?)					DHB				
Herptiles	The second section of the	OF COLUMN	AND CONTRACTOR OF		The state of the state of	The state of the	100 100 100		
none observed									
Amphibians Amphibians	to the second of the second of the	<b>建设是这种企业的</b>	1		<b>西</b> 第55 1.784	<b>通报</b> 的图象图			
none observed									
Crustaceans	数 中心 (14 14 2 14 14 14 14 14 14 14 14 14 14 14 14 14	<b>建筑在3000000000000000000000000000000000000</b>	1085 TO 10	和5学科学		Topic City State	李勒的此		
none observed									

Wildlife Observation Codes:

CA=Calling FL=Flight SC=Scat CA=Calling FG=Browse/Forage SL=Slide NE=Nest DHB=Den, Hut, Burrow

FG=Foraging TR=Tracks OB=Observed
FE=Feeding DB=Day be RS=Resting/Perching

December 2005

#### TABLE 21 EXPOSURE PATHWAY ASSESSMENT

			Operable Units OU-1/OU-2			Control of the Contro
Receptor Group	Representative Species	Exposure Pathways (4)	Spatial Scale	Temporal Scale	Eliminated as Receptor?	Rationale for Elimination
Aquatic invertebrates	Various freshwater taxa	Potentially complete: ingestion of and dermal contact with sediment	Snow Creek and stormwater retention structure substrates	Year-round with seasonal fluctuations	No	NA
Terrestrial invertebrates	Various taxa	Incomplete	Limited to areas above creek bank	Year-round with seasonal fluctuations	Yes	Limited habitat and generally low habitat qualit
Omnivorous fish	Suckers; minnows	Potentially complete: diet, maternal transfer, dermal contact with sediment	Snow Creek only; no fish in stormwater retention structure	Year-round with seasonal fluctuations and spawning in the spring	No	NA
Predatory fish	Largemouth bass	Not Applicable	Not present in Snow Creek or in stormwater retention structure	Not Applicable	Yes	Predatory fish not present in Snow Creek; limited to warmwater species tolerant of low dissolved oxygen
Reptiles/amphibians	Various turtle and frog species	Potentially complete: diet, maternal transfer, dermal contact with sediment	Snow Creek and stormwater retention structure	Year round with seasonal abundance in spring, summer and fall	No	NA
Invertivorous birds	Passerines	Incomplete	Snow Creek and stormwater retention structure substrates; but with habitat constraints (see Rationale)	Year-round with seasonal fluctuations	Yes	Low habitat quality (see results of KPM); low population densities using only small isolated patches of fragmented habitat that borders creek
Omnivorous birds	Pheasants, ducks, geese	Incomplete	Wooded areas and shallow vegetated pools or reaches in Snow Creek and along shore of retention structure	Spring, summer, and fall	Yes	Habitat limited or poor, lower potential for exposure than insectivorous or piscivorous birds; populations actively managed
Piscivorous birds	Great blue heron; kingfisher	Incomplete	Calhoun County; Snow Creek, but with habitat constraints (see Rationale)	Spring, summer, and fall	Yes	Low habitat quality (see results of KPM); low population densities using only small isolated patches of fragmented habitat that borders creek; large home and forage range
Carnivorous birds	Bald eagle, hawks, falcons, owls	Incomplete	Calhoun County but with habitat constraints (see Rationale)	Year-round with seasonal fluctuations	Yes	Habitat limited or poor (see results of KPM); lower potential for exposure than piscivorous birds; large home ranges; low population densities
Invertivorous mammals	White footed mouse; shrew	Incomplete	Terrestrial borders of Snow Creek	Spring, summer, and fall	Yes	Restricted to terrestrial habitats above Snow Creek bank; lower potential of exposure to sediments - diet from terrestrial invertebrates
Omnivorous mammals	Martens, fishers, raccoons	Incomplete	Terrestrial and riparian wooded borders of Snow Creek and stormwater retention structure	Year-round with seasonal fluctuations; spring kits	Yes	Habitat limited or poor (see results of KPM); lower potential for exposure than piscivorous mammals; large home ranges; low population densities
Piscivorous mammals	River otter; mink	Incomplete	Choccolocco Creek Valley and catchment area; Snow Creek, but with habitat constraints (see Rationale)	Year-round with seasonal fluctuations; spring kits	Yes	Suitable habitat not present; highly fragmented by bordering land uses, roads, rails; fish community (as food source) limited to small populations of tolerant species
Carnivorous mammals	Long-tailed weasel, ermine	Incomplete	Terrestrial and riparian wooded borders of Snow Creek and stormwater retention structure	Year-round with seasonal fluctuations	Yes	Lower potential for exposure than piscivorous mammals; large home ranges; low population densities

December 2005

#### TABLE 21 EXPOSURE PATHWAY ASSESSMENT

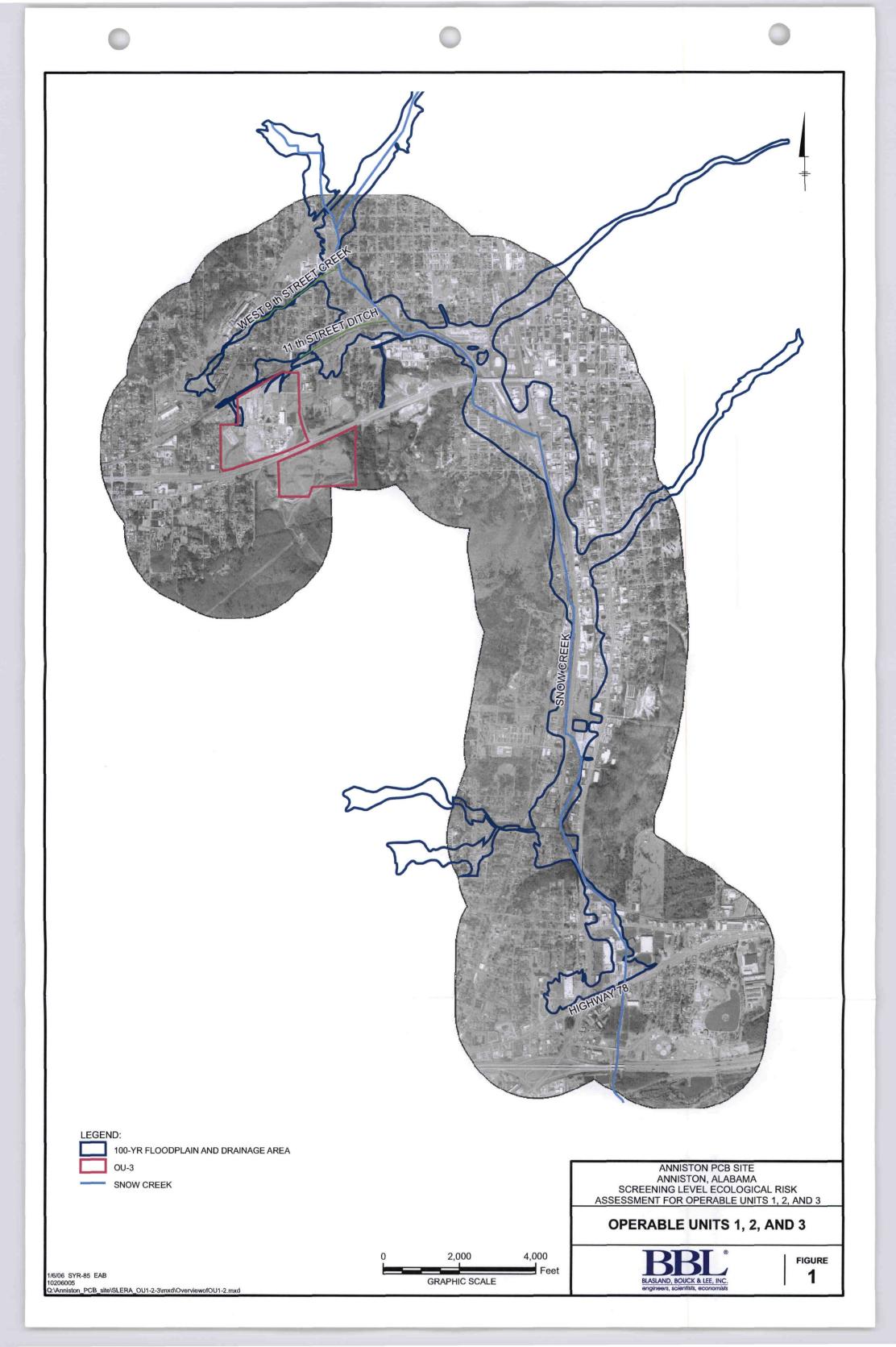
Operable Unit OU-3								
Receptor Group	Representative Species	Exposure Pathway	ys <sup>(a)</sup> Spatial Scale	Temporal Scale	Eliminated as Receptor?	Rationale for Elimination		
Terrestrial invertebrates	Various taxa	Incomplete	Limited to tall grasses in successional old field surface of landfill caps; open area	Dependent on successional stage development, frequent maintainance disturbs seasonal succession of habitat and establishment of invertebrate communities	Yes	Poor habitat quality (see results of KPM); compaction of soil habitat truncates exposure to contaminants; frequent disturbance of landfil cap surfaces by bushhogging; mowing, etc.; open area is isolated and bordered by fence and maintained grounds or impervious layers.		
Invertivorous birds	Passerines	incomplete	Potentially all areas; but with habitat constraints (see Rationale)	Year-round with seasonal changes in abundance	Yes	Poor habitat quality (see results of KPM); cove and perch sites minimal or absent; terrestrial invertebrates low potential of exposed to PCBs so not contaminated food source		
Omnivorous birds	Pheasants, geese	Incomplete	Wooded areas	Spring, summer, and fall	Yes	Habitat (cover) extremely limited or poor; lower potential for exposure than insectivorous birds populations actively managed		
Carnivorous birds	Bald eagle, hawks, falcons, owls	Incomplete	Calhoun County but with habitat constraints (see Rationale)	Year-round with seasonal fluctuations	Yes	Habitat limited or poor (see results of KPM); large home ranges; low population densities and low prey density (see invertivorous mammals)		
Invertivorous mammals	White footed mouse, shrew	Incomplete	Potentially all areas; but with habitat or access constraints (see Rationale)	Year-round with seasonal changes in abundance	Yes	Poor habitat quality. Mammals not observed b sight, track, burrows or other means during survey work. Most areas fenced in making access to habitats difficult. Fabric on landfill is barrier to burrowing. Terrestrial invertebrates low potential of exposure to PCBs so not contaminated food source		
Omnivorous mammals	Martens, fishers, raccoons	Incomplete	Mainly wooded areas	Year-round with seasonal fluctuations; spring kits	Yes	Habitat limited or poor (see results of KPM); most areas fenced in making access to habitats difficult; large home ranges; low population densities		
Carnivorous mammals	Long-tailed weasel, ermine	Incomplete	Mainly wooded areas	Year-round with seasonal fluctuations	Yes	Most areas fenced in making access to habitats difficult; large home ranges; low population densities		

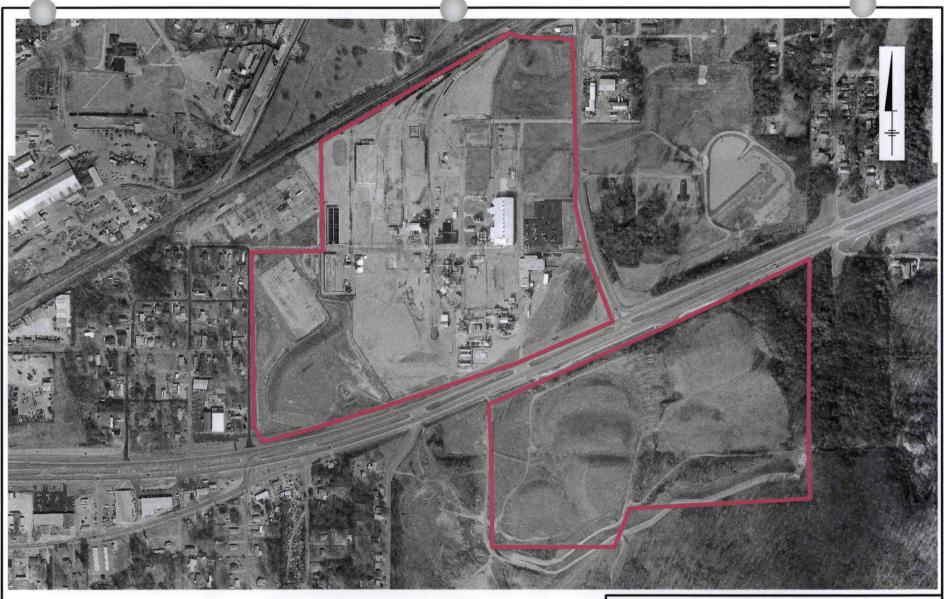
Note:
1. This table lists the most important exposure pathways for each receptor group. Certain exposure pathways are not listed because they would not contribute appreciably to exposure. These include inhalation, plant uptake by herbivores, and gill transfer in fish.

2. Potentially complete exposure pathways are highlighted.

**Figures** 

BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists





LEGEND:

OU-3

ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

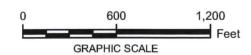
#### **OPERABLE UNIT 3**

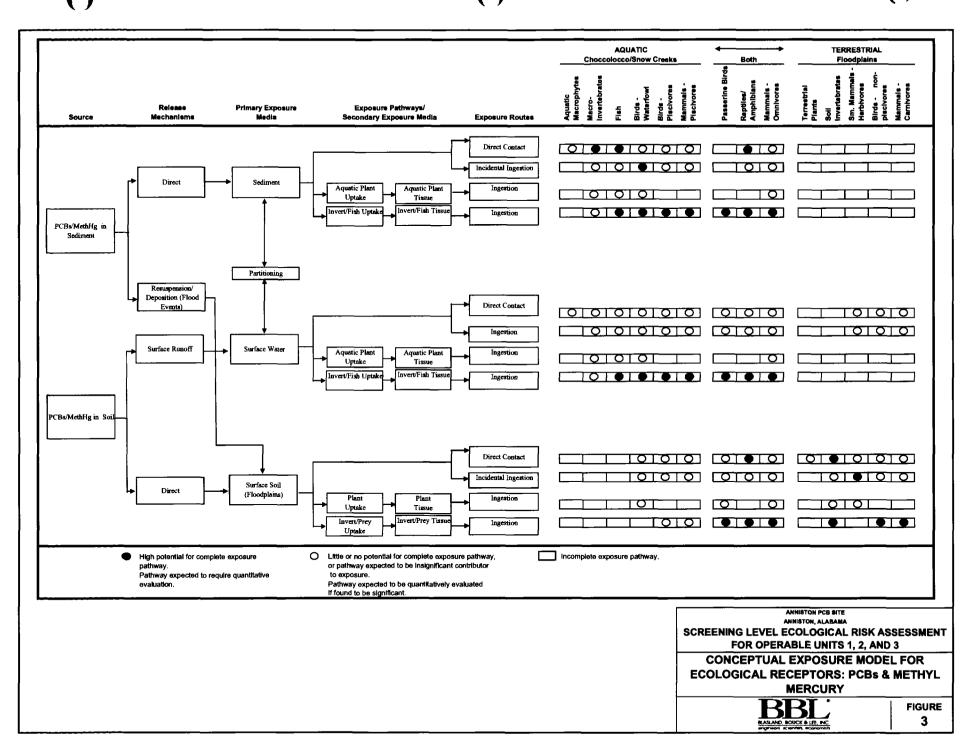
BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

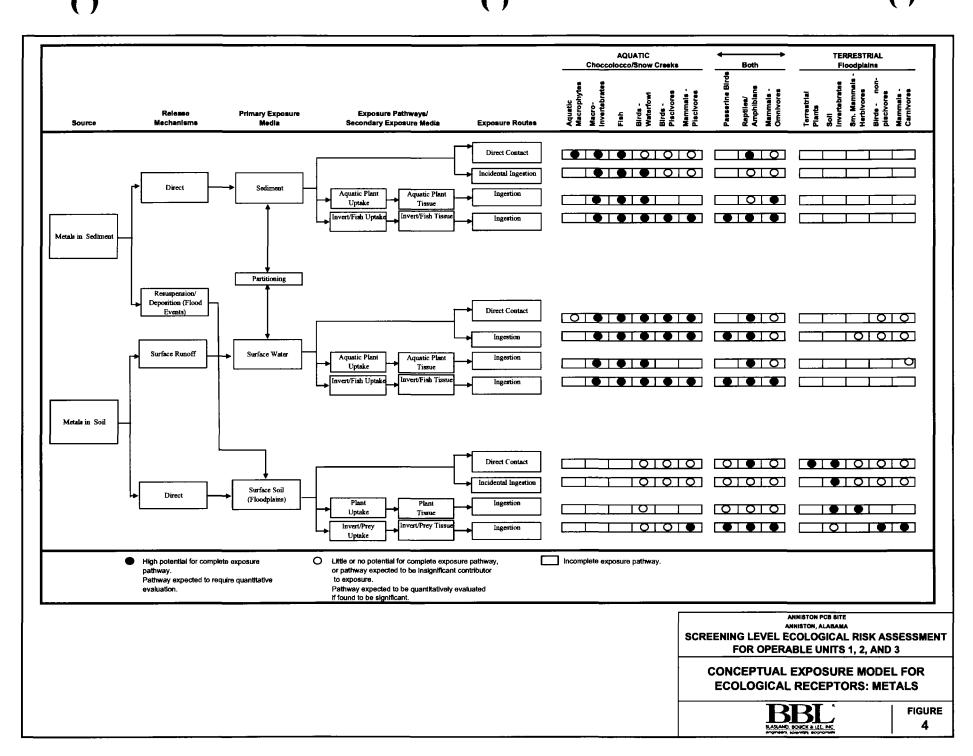
**FIGURE** 

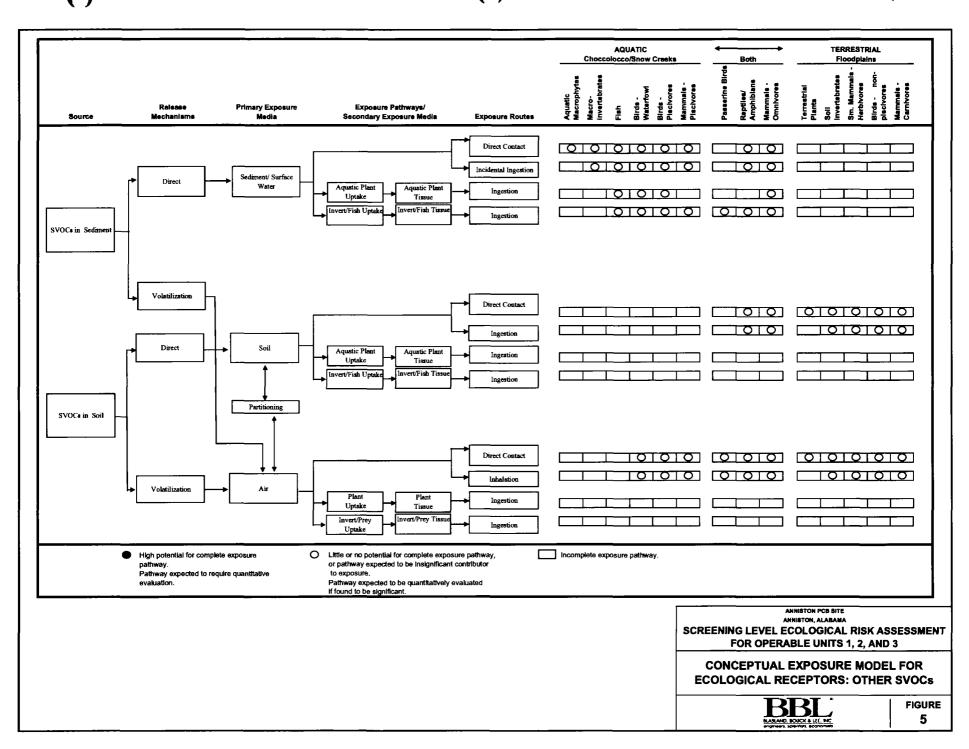
2

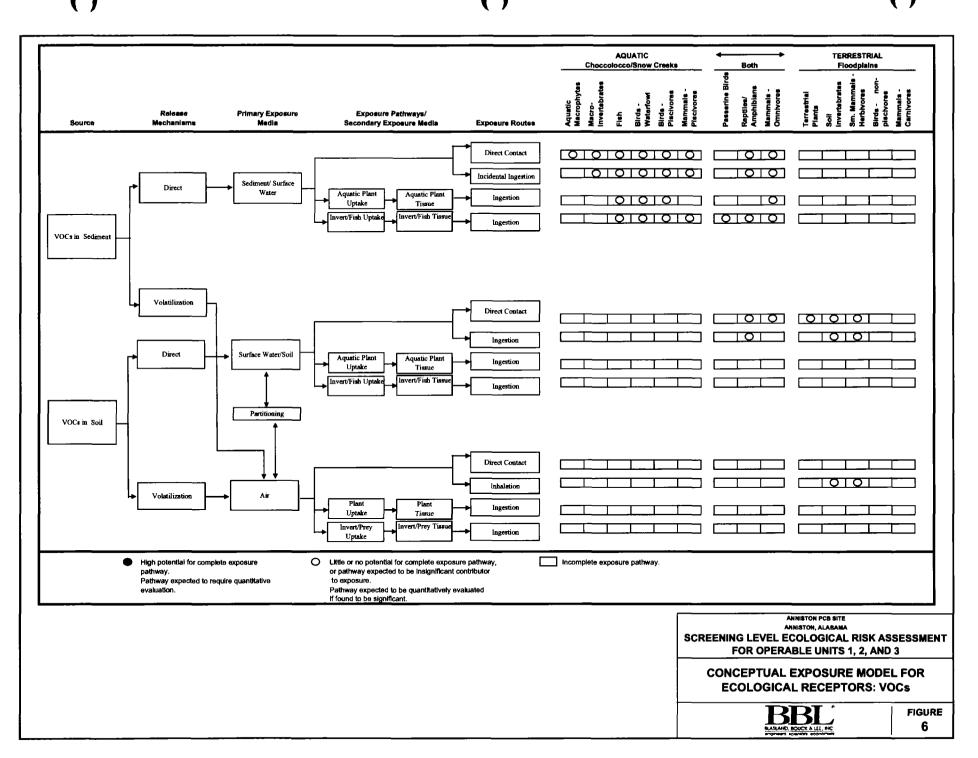
12/13/05 SYR-85 EAB 10206005 Q:\Anniston\_PCB\_site\SLERA\_OU1-2-3\mxd\OU3.mxd

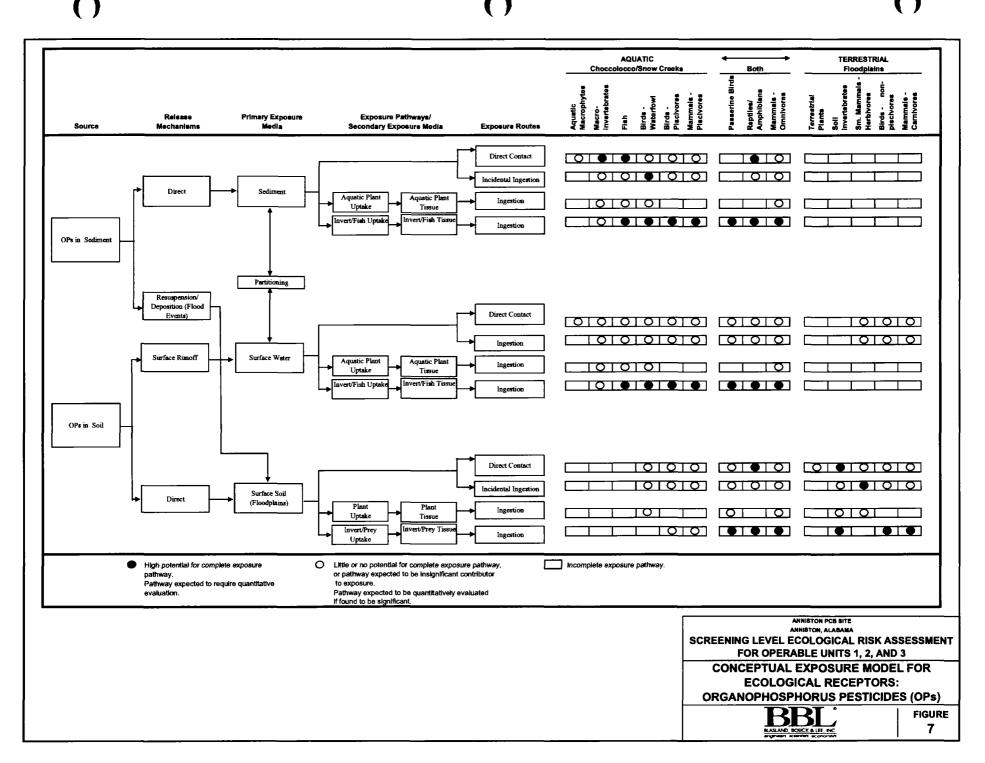


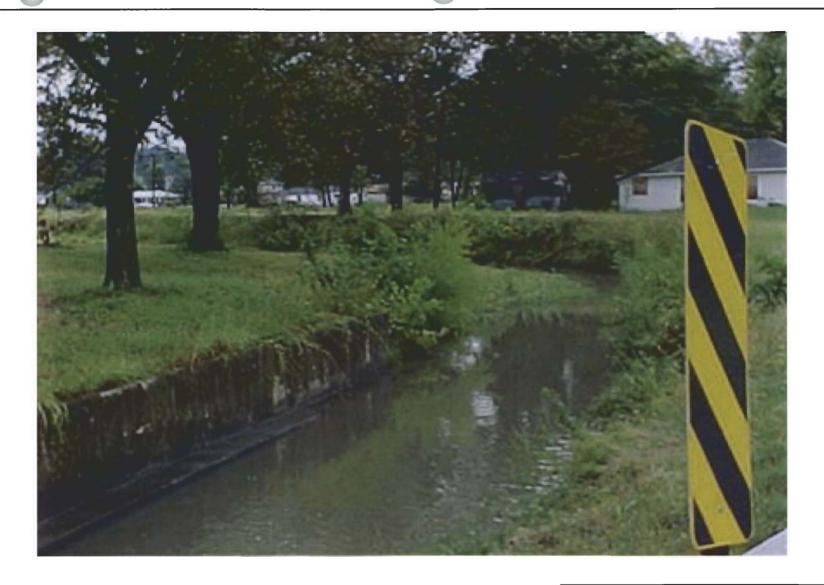








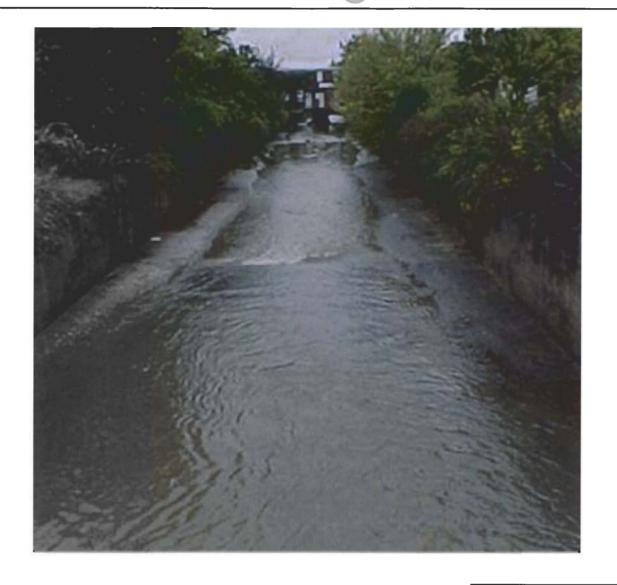




SNOW CREEK FLOWING THROUGH A RESIDENTIAL AREA (UPSTREAM VIEW)



**FIGURE** 



SNOW CREEK FLOWING THROUGH A RESIDENTIAL AREA (DOWNSTREAM VIEW)



**FIGURE** 



RIPARIAN VEGETATION AND DEPOSITIONAL BARS IN SNOW CREEK (BELOW NOBLE STREET)



FIGURE 10



SNOW CREEK BEFORE FLOWING INTO CULVERT UNDER QUINTARD MALL (IN BACKGROUND)



FIGURE



RESIDENTIAL MAINTAINED LAWNS AND SPARSE ORNAMENTALTREES



FIGURE



RESIDENTIAL MAINTAINED LAWNS AND SPARSE ORNAMENTALTREES



FIGURE



EXAMPLE OF RESIDENTIAL AREAS WHERE NETWORKS OF ROADS, ROOFTOPS AND PARKING AREAS ELIMINATE HABITAT



**FIGURE** 



MAINTAINED LAND USE TO EDGE OF SNOW CREEK (UPSTREAM). NOTE: UNSTABLE BANKS DUE TO EROSION AND SLOUGHING



FIGURE 15



INDUSTRIAL LAND USE WITH MAINTAINED FIELD AND SPARSE ORNAMENTAL TREES AND SHRUBS



FIGURE



INDUSTRIAL LAND USE SHOWING IMPERVIOUS
LAYERS OF FACILITY ENVIRONS AND NO

BBB Businant, mouter & LEE, INC. engineers, schipatists are manages

FIGURE 17



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
FOR OPERABLE UNITS 1, 2, AND 3

COMMERCIAL LAND USE WITH EXTENSIVE IMPERVIOUS LAYER AND ESSENTIALLY NO HABITAT



FIGURE

18



ANNISTON, ALABAMA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

EXTENSIVE PARKING AREAS AND SMALL ISLANDS OF ORNAMENTAL TREES AND SHRUBS AT QUINTARD MALL



**FIGURE** 

19



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
FOR OPERABLE UNITS 1, 2, AND 3

RECREATION/SCHOOL LAND USE SHOWING LARGE MANICURED FIELD FOR SPORTS





ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL BOOLOGICAL RISK ASSESSMENT
FOR OPERABLE UNITS 1, 2, AND 3

RECREATION/SCHOOL LAND USE SHOWING DRAINAGE DITCH BEFORE BORDERING FIELD



**FIGURE** 

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### ANNISTON PCB SITE

ANNISTON, ALABAMA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

WEST END LANDFILL: RIP-RAPPED DRAINAGE **SWALE** 





ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
FOR OPERABLE UNITS 1, 2, AND 3

NORTHEAST PORTION OF FACILITY: MAINTAINED LAWN



**FIGURE** 

23



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT
FOR OPERABLE UNITS 1, 2, AND 3

**NORTH VIEW OF SOUTH LANDFILL** 



**FIGURE** 

24



SNOW CREEK SAMPLING STATION BOUNDARIES

1/6/06 SYR-85 EAB
Anniston 10206
Q:\Anniston\_PCB\_Site\SLERA\_OU1-2-3\mxd\WildlifeTransects-OU1-2.mxd

2,400 1,200 Feet **GRAPHIC SCALE** 

**SNOW CREEK SAMPLING** STATION LOCATIONS

BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists





	Fish Survey		Ве	nthic Macro	Inverteb	orate S	Survey		A COMPANY	ldlife rvations
Station		Distril	bution o	f Kicks by H	abitat Ty	pe (%	of 20 kick	s/jabs)*		
	Total Shock Time (min)	Cobble	Snag	Vegetated Banks	Sand & Gravel	SAV	Bedrock Outcrop	Other - see notes	Total Transect Length (ft)	Total Observation Time (min)
SC-STA-1	40	20		20	60				200	200
SC-STA-2	36	50			50				200	205
SC-STA-3	24	50			50				100	175
SC-STA-4	28	60			40				100	180
SC-STA-5*	39	31	11	8	34		8	8	100	250
RP-1	31			60		30		10	240	160

\* - more kicks/jabs at this location SC-STA-5 "Other" was detritus/leaf litter RP-1 "Other" is emergent vegetation (Alligator weed)

1/6/06 SYR-85 EAB Anniston 10206

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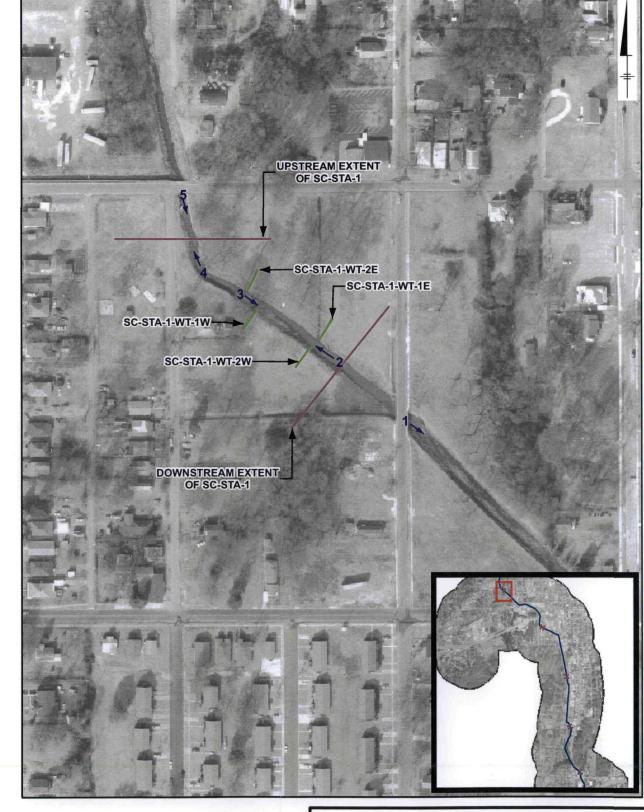






NOTE:

ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.



#### LEGEND:

- WILDLIFE OBSERVATION TRANSECT
- SNOW CREEK SAMPLING STATION BOUNDARIES
- PHOTO ID AND CAMERA DIRECTION



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

**BIOSURVEY LOCATIONS ON SNOW CREEK: STA-1** 



	S - Low Gradient Streams	Condition Catergory & Score Optimal (20 - 16) Suboptimal (15 - 11) Marginal (10 - 6) Poor (5 - 0)									
Ve	aciles	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5					
Epifaunal Substrate	Available Cover	8	11	17	12	17					
Pool Substrate Char	racterization	14	8	7	8	4					
Pool Variability		3	4	8	11	15					
Sediment Deposition	n	14	12	17	14	17					
Channel Flow Status		17	17	17	17	18					
Channel Alteration		14	17	18	18	9					
Channel Sinuosity		5	6	3	4	6					
Bank Stability	Right Bank (10 - 0)	9	9	7	10	10					
Bank Stability	Left Bank (10 - 0)	9	9	10	10	10					
Vegetative	Right Bank (10 - 0)	9	9	7	10	9					
Protection	Left Bank (10 - 0)	8	8	10	9	7					
Riparian Vegetative	Right Bank (10 - 0)	6	6	1	5	2					
Zone Width	Left Bank (10 - 0)	6	5	2	2	1					
TOTAL SCORE		122	121	124	130	125					

Note: Habitat evaluation performed using the methods outlined in the USEPA's Rapid Bioassessment Protocols for Streams and Wadable Rivers

Succion Observed		Co	unt by Locat	ion		Total
Species Observed	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	Fish
Largescale Stoneroller (Campostoma oligolepis)	15	21	2	70	91	199
Eastern Mosquitofish (Gambusia holbrooki)	110	2		7		119
Unknown Shiner #2 (Notropis spp.)		5	8	62	3	78
Unknown Shiner #1 (Notropis spp.)		12	3	23	4	42
Bluespotted Sunfish (Enneacanthus gloriosus)	2	18	1	5	1	27
Unknown Shiner #3 (Notropis spp.)			7			7
Bluegill (Lepomis macrochirus)				6		6
Unknown Shiner (Cyprinella sp.)				3	1	4
Creek Chub (Semotilus atromaculatus)			1			1
Suckermouth minnow (Phenacobius mirabilis)				1		1
Longear Sunfish (Lepomis megalotis)					1	1
Black Redhorse (Moxostoma duquesnei)					1	1
Yellow Bullhead (Ameiurus natalis)					1	1
Total Fish	127	58	22	177	103	487
Species Richness	3	5	6	8	8	13
Total Shock Time (seconds)	2,386	2,146	1,468	1,678	2,322	10,000
Catch per unit Effort	0.053	0.027	0.015	0.105	0.044	0.049

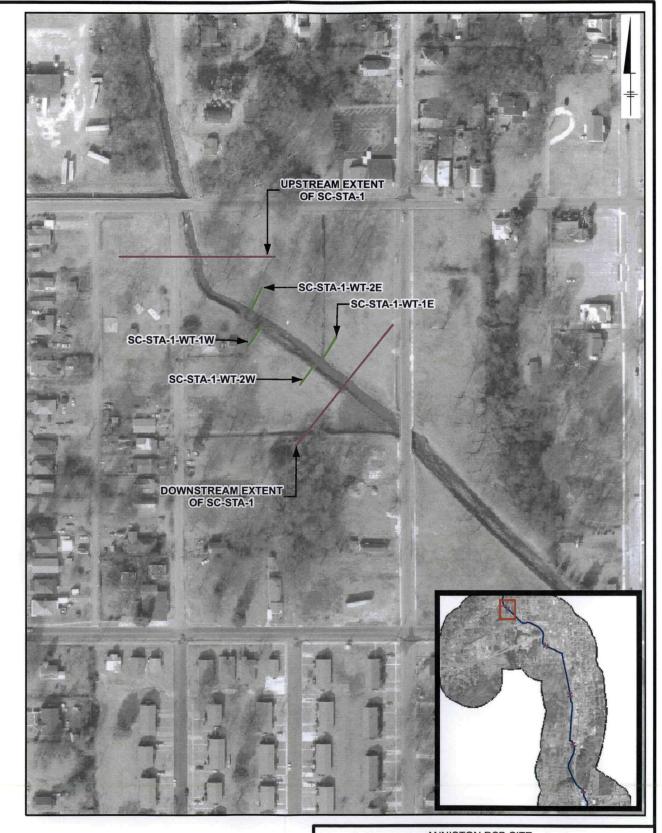
Note: 1,853 seconds of shocking in the stormwater containment structure yielded no fish

	Benthic Mad	croinvetel	brate Sum	mary Met	rics		
Metric	Expected Response	STA-1	STA-2	STA-3	STA-4	STA-5	RP-1
Total Number of Specimens	Decrease	97	106	16	28	16	331
Species Richness	Decrease	19	13	5	7	4	31
Percent EPT	Decrease	0	42	19	14	63	37
Percent Diptera	Increase	23	45	69	82	31	10

Note: Expected Response indicates the response to each metric in the presence of perturbation

#### NOTE:

1. ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.





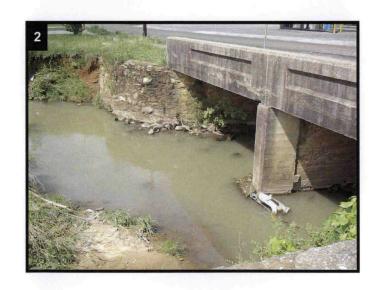
- WILDLIFE OBSERVATION TRANSECT
- SNOW CREEK SAMPLING STATION BOUNDARIES



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

**BIOSURVEY RESULTS FOR STA-1** 





	Fish Survey		Be	nthic Macro	olnverteb	orate :	Survey		and the second second second	ldlife rvations
Station		Distri	bution o	of Kicks by H	abitat Ty	pe (%	of 20 kick	(s/jabs)*		
	Total Shock Time (min)	Cobble	Snag	Vegetated Banks	Sand & Gravel	SAV	Bedrock Outcrop	Other - see notes	Total Transect Length (ft)	Total Observation Time (min)
SC-STA-1	40	20	-	20	60				200	200
SC-STA-2	36	50			50				200	205
SC-STA-3	24	50			50				100	175
SC-STA-4	28	60			40				100	180
SC-STA-5*	39	31	11	8	34		8	8	100	250
RP-1	31			60		30		10	240	160

\* - more kicks/jabs at this location SC-STA-5 "Other" was detritus/leaf litter RP-1 "Other" is emergent vegetation (Alligator weed)

1/6/06 SYR-85 EAB
Anniston 10206
Q:\text{Anniston PCB Site\SLERA OU1-2-3\mxd\WildlifeTransects-STA-2-Landscape.mxd}



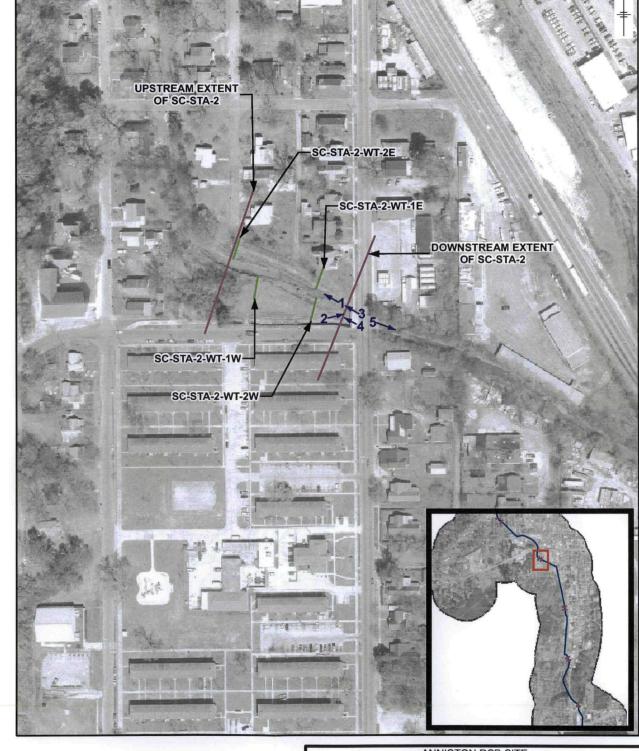






ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.

NOTE:



#### LEGEND:

- WILDLIFE OBSERVATION TRANSECT
- —— SNOW CREEK SAMPLING STATION BOUNDARIES
- PHOTO ID AND CAMERA DIRECTION



ANNISTON PCB SITE ANNISTON, ALABAMA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

**BIOSURVEY LOCATIONS ON** SNOW CREEK: STA-2



	S - Low Gradient Streams	Condition Catergory & Score  Optimal (20 - 16) — Suboptimal (15 - 11) — Marginal (10 - 6) — Poor (5 - 0)									
Re	aches	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5					
Epifaunal Substrate/	Available Cover	8	11	17	12	17					
Pool Substrate Char	racterization	14	8	7	8	4					
Pool Variability		3	4	8	11	15					
Sediment Deposition	n	14	12	17	14	17					
Channel Flow Status		17	17	17	17	18					
Channel Alteration		14	17	18	18	9					
Channel Sinuosity		5	6	3	4	6					
Dank Ctability	Right Bank (10 - 0)	9	9	7	10	10					
Bank Stability	Left Bank (10 - 0)	9	9	10	10	10					
Vegetative	Right Bank (10 - 0)	9	9	7	10	9					
Protection	Left Bank (10 - 0)	8	8	10	9	7					
Riparian Vegetative		6	6	1	5	2					
Zone Width Left Bank (10 - 0)		6	5	2	2	1					
TOTAL SCORE	<u> </u>	122	121	124	130	125					

Note: Habitat evaluation performed using the methods outlined in the USEPA's Rapid Bioassessment Protocols for Streams and Wadable Rivers

	Count by Location							
Species Observed	SC-STA-1		SC-STA-3		SC-STA-5	Total Fish		
Largescale Stoneroller (Campostoma oligolepis)	15	21	2	70	91	199		
Eastern Mosquitofish (Gambusia holbrooki)	110	2		7	71	119		
Unknown Shiner #2 (Notropis spp.)		5	8	62	3	78		
Unknown Shiner #1 (Notropis spp.)		12	3	23	4	42		
Bluespotted Sunfish (Enneacanthus gloriosus)	2	18	1	5	1	27		
Unknown Shiner #3 (Notropis spp.)			7			7		
Bluegill (Lepomis macrochirus)				6		6		
Unknown Shiner (Cyprinella sp.)				3	1	4		
Creek Chub (Semotilus atromaculatus)		1 17 20	1			1		
Suckermouth minnow (Phenacobius mirabilis)				1		1		
Longear Sunfish (Lepomis megalotis)					1	1		
Black Redhorse (Moxostoma duquesnei)					1	1		
Yellow Bullhead (Ameiurus natalis)		Land Section			1	1		
Total Fish	127	58	22	177	103	487		
Species Richness	3	5	6	8	8	13		
Total Shock Time (seconds)	2,386	2,146	1,468	1,678	2,322	10,000		
Catch per unit Effort	0.053	0.027	0.015	0.105	0.044	0.049		

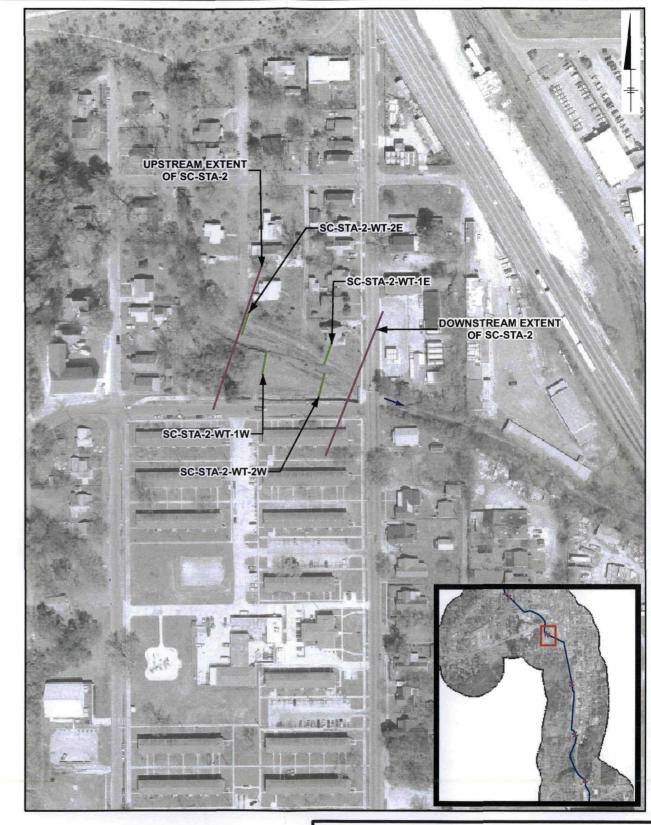
Note: 1,853 seconds of shocking in the stormwater containment structure yielded no fish

	Benthic Mad	croinvetel	orate Sum	mary Met	rics		
Metric	Expected Response	STA-1	STA-2	STA-3	STA-4	STA-5	RP-1
Total Number of Specimens	Decrease	97	106	16	28	16	331
Species Richness	Decrease	19	13	5	7	4	31
Percent EPT	Decrease	0	42	19	14	63	37
Percent Diptera	Increase	23	45	69	82	31	10

Note: Expected Response indicates the response to each metric in the presence of perturbation

#### NOTE:

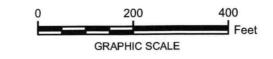
ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.





— WILDLIFE OBSERVATION TRANSECT

SNOW CREEK SAMPLING STATION BOUNDARIES



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

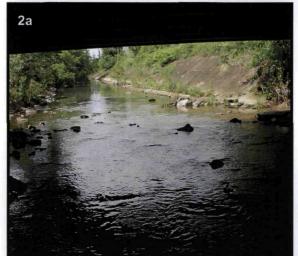
**BIOSURVEY RESULTS FOR STA-2** 



**FIGURE** 29

1/6/06 SYR-85 EAB
Anniston 10206
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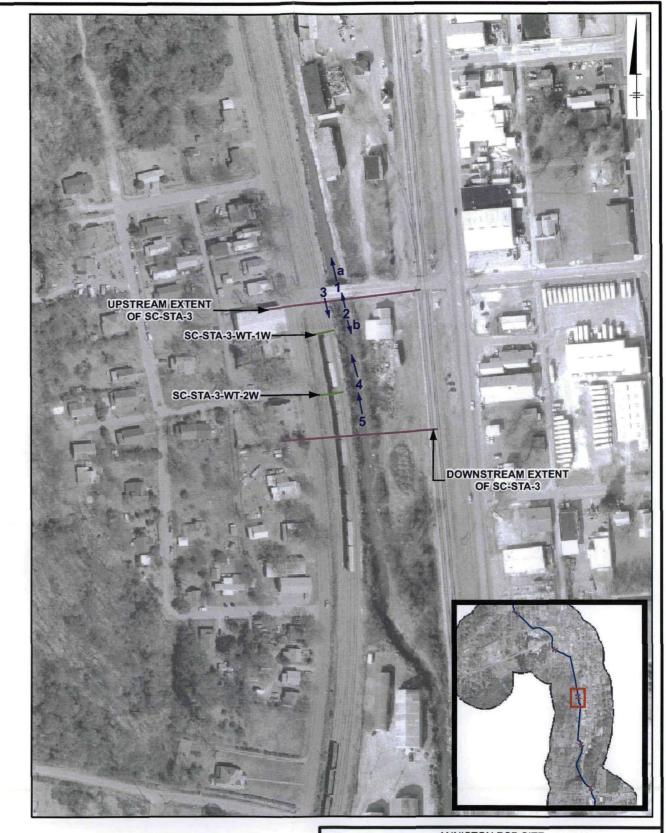
	Fish Survey		Ве	nthic Macro	olnvertel	orate s	Survey			ldlife rvations
Station		Distrib	Distribution of Kicks by Habitat Type (% of 20 kicks/jabs)*							
	Total Shock Time (min)	Cobble	Snag	Vegetated Banks	Sand & Gravel	SAV	Bedrock Outcrop		Total Transect Length (ft)	Total Observation Time (min)
SC-STA-1	40	20	1000	20	60		10		200	200
SC-STA-2	36	50			50				200	205
SC-STA-3	24	50			50				100	175
SC-STA-4	28	60			40				100	180
SC-STA-5*	39	31	11	8	34		8	8	100	250
RP-1	31			60		30		10	240	160

\*- more kicks/jabs at this location SC-STA-5 "Other" was detritus/leaf litter RP-1 "Other" is emergent vegetation (Alligator weed)

1/6/06 SYR-85 EAB
Anniston 10206
Q:\Anniston PCB Site\SLERA OU1-2-3\mxd\WildlifeTransects-STA-3-Landscape.mxd

#### NOTE:

 ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.

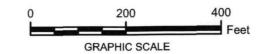


#### LEGEND:

— WILDLIFE OBSERVATION TRANSECT

SNOW CREEK SAMPLING STATION BOUNDARIES

2 PHOTO ID AND CAMERA DIRECTION



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

BIOSURVEY LOCATIONS ON SNOW CREEK: STA-3



		Tabitat Eva	luation Summ	ury							
	S - Low Gradient Streams	Condition Catergory & Score Optimal (20 - 16) — Suboptimal (15 - 11) — Marginal (10 - 6) — Poor (5 - 0)									
N.C.	acines	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5					
Epifaunal Substrate	Available Cover	8	11	17	12	17					
Pool Substrate Char	racterization	14	8	7	8	4					
Pool Variability		3	4	8	11	15					
Sediment Deposition	n	14	12	17	14	17					
Channel Flow Status	S	17	17	17	17	18					
Channel Alteration		14	17	18	18	9					
Channel Sinuosity		5	6	3	4	6					
Bank Stability	Right Bank (10 - 0)	9	9	7	10	10					
Dank Stability	Left Bank (10 - 0)	9	9	10	10	10					
Vegetative	Right Bank (10 - 0)	9	9	7	10	9					
Protection	Left Bank (10 - 0)	8	8	10	9	7					
Riparian Vegetative	Right Bank (10 - 0)	6	6	1	5	2					
Zone Width	Left Bank (10 - 0)	6	5	2	2	1					
TOTAL SCORE		122	121	124	130	125					

Note: Habitat evaluation performed using the methods outlined in the USEPA's Rapid Bioassessment Protocols for Streams and Wadable Rivers

S	Count by Location							
Species Observed	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	Fish		
Largescale Stoneroller (Campostoma oligolepis)	15	21	2	70	91	199		
Eastern Mosquitofish (Gambusia holbrooki)	110	2	E 4 3 1 2	7		119		
Unknown Shiner #2 (Notropis spp.)		5	8	62	3	78		
Unknown Shiner #1 (Notropis spp.)		12	3	23	4	42		
Bluespotted Sunfish (Enneacanthus gloriosus)	2	18	1	5	1	27		
Unknown Shiner #3 (Notropis spp.)			7			7		
Bluegill (Lepomis macrochirus)			March 1	6		6		
Unknown Shiner (Cyprinella sp.)				3	1	4		
Creek Chub (Semotilus atromaculatus)			1			1		
Suckermouth minnow (Phenacobius mirabilis)				1		1		
Longear Sunfish (Lepomis megalotis)					1	1		
Black Redhorse (Moxostoma duquesnei)					1	1		
Yellow Bullhead (Ameiurus natalis)					1	1		
Total Fish	127	58	22	177	103	487		
Species Richness	3	5	6	8	8	13		
Total Shock Time (seconds)	2,386	2,146	1,468	1,678	2,322	10,000		
Catch per unit Effort	0.053	0.027	0.015	0.105	0.044	0.049		

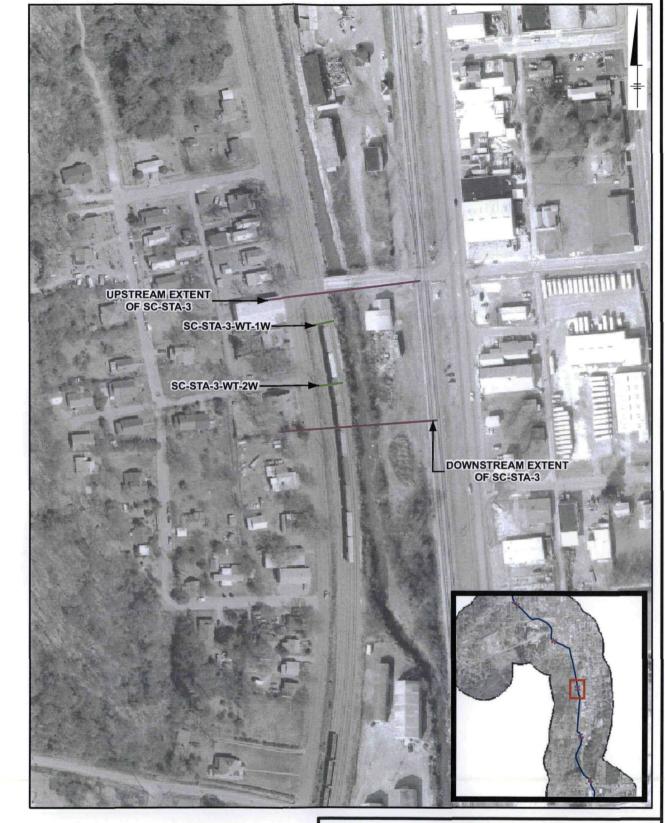
Note: 1,853 seconds of shocking in the stormwater containment structure yielded no fish

	Benthic Mad	croinvetel	orate Sum	mary Met	rics		
Metric	Expected Response	STA-1	STA-2	STA-3	STA-4	STA-5	RP-1
Total Number of Specimens	Decrease	97	106	16	28	16	331
Species Richness	Decrease	19	13	5	7	4	31
Percent EPT	Decrease	0	42	19	14	63	37
Percent Diptera	Increase	23	45	69	82	31	10

Note: Expected Response indicates the response to each metric in the presence of perturbation

#### NOTE

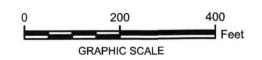
 ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.



LEGEND:

— WILDLIFE OBSERVATION TRANSECT

SNOW CREEK SAMPLING STATION BOUNDARIES



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

**BIOSURVEY RESULTS FOR: STA-3** 

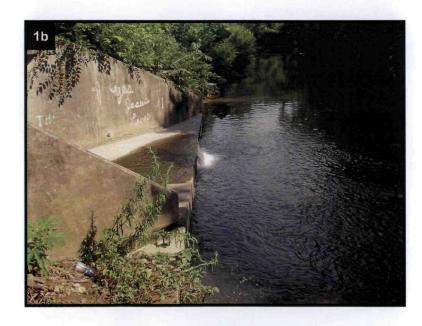


FIGURE 31

1/6/06 SYR-85 EAB
Anniston 10206
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	Fish Survey		Ве	nthic Macro	Inverteb	orate \$	Survey			Idlife vations
Station		Distrib	bution o	f Kicks by H	abitat Ty	pe (%	of 20 kick	(s/jabs)*		
	Total Shock Time (min)	Cobble	Snag	Vegetated Banks	Sand & Gravel	SAV	Bedrock Outcrop	Other - see notes	Total Transect Length (ft)	Total Observation Time (min)
SC-STA-1	40	20		20	60				200	200
SC-STA-2	36	50			50				200	205
SC-STA-3	24	50			50				100	175
SC-STA-4	28	60			40				100	180
SC-STA-5*	39	31	11	8	34		8	8	100	250
RP-1	31			60		30		10	240	160

\* - more kicks/jabs at this location SC-STA-5 "Other" was detritus/leaf litter RP-1 "Other" is emergent vegetation (Alligator weed)

### NOTE:

ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.

#### LEGEND:

---- WILDLIFE OBSERVATION TRANSECT

SNOW CREEK SAMPLING STATION BOUNDARIES

PHOTO ID AND CAMERA DIRECTION



ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

DOWNSTREAM EXTENT
OF SC-STA-4

UPSTREAM EXTENT OF SC-STA-4

SC-STA-4-WT-2E

SC-STA-4-WT-1E

**BIOSURVEY LOCATIONS ON SNOW CREEK: STA-4** 



	S - Low Gradient Streams	Condition Catergory & Score Optimal (20 - 16) — Suboptimal (15 - 11) — Marginal (10 - 6) — Poor (5 - 0)									
Ne	acries	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5					
<b>Epifaunal Substrate</b>	/Available Cover	8	11	17	12	17					
Pool Substrate Cha	racterization	14	8	7	8	4					
Pool Variability		3	4	8	11	15					
Sediment Depositio	n	14	12	17	14	17					
Channel Flow Statu	S	17	17	17	17	18					
Channel Alteration		14	17	18	18	9					
Channel Sinuosity		5	6	3	4	6					
Bank Stability	Right Bank (10 - 0)	9	9	7	10	10					
Dank Stability	Left Bank (10 - 0)	9	9	10	10	10					
Vegetative	Right Bank (10 - 0)	9	9	7	10	9					
Protection	Left Bank (10 - 0)	8	8	10	9	7					
Riparian Vegetative	Right Bank (10 - 0)	6	6	1	5	2					
Zone Width	Left Bank (10 - 0)	6	5	2	2	1					
TOTAL SCORE		122	121	124	130	125					

Note: Habitat evaluation performed using the methods outlined in the USEPA's Rapid Bioassessment Protocols for Streams and Wadable Rivers

Species Observed	Count by Location							
Species Observed	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	Fish		
Largescale Stoneroller (Campostoma oligolepis)	15	21	2	70	91	199		
Eastern Mosquitofish (Gambusia holbrooki)	110	2		7	5	119		
Unknown Shiner #2 (Notropis spp.)		5	8	62	3	78		
Unknown Shiner #1 (Notropis spp.)		12	3	23	4	42		
Bluespotted Sunfish (Enneacanthus gloriosus)	2	18	1	5	1	27		
Unknown Shiner #3 (Notropis spp.)			7			7		
Bluegill (Lepomis macrochirus)		-		6		6		
Unknown Shiner (Cyprinella sp.)				3	1	4		
Creek Chub (Semotilus atromaculatus)			1			1		
Suckermouth minnow (Phenacobius mirabilis)				1		1		
Longear Sunfish (Lepomis megalotis)					1	1		
Black Redhorse (Moxostoma duquesnei)				100	1	1		
Yellow Bullhead (Ameiurus natalis)					1	1		
Total Fish	127	58	22	177	103	487		
Species Richness	3	5	6	8	8	13		
Total Shock Time (seconds)	2,386	2,146	1,468	1,678	2,322	10,000		
Catch per unit Effort	0.053	0.027	0.015	0.105	0.044	0.049		

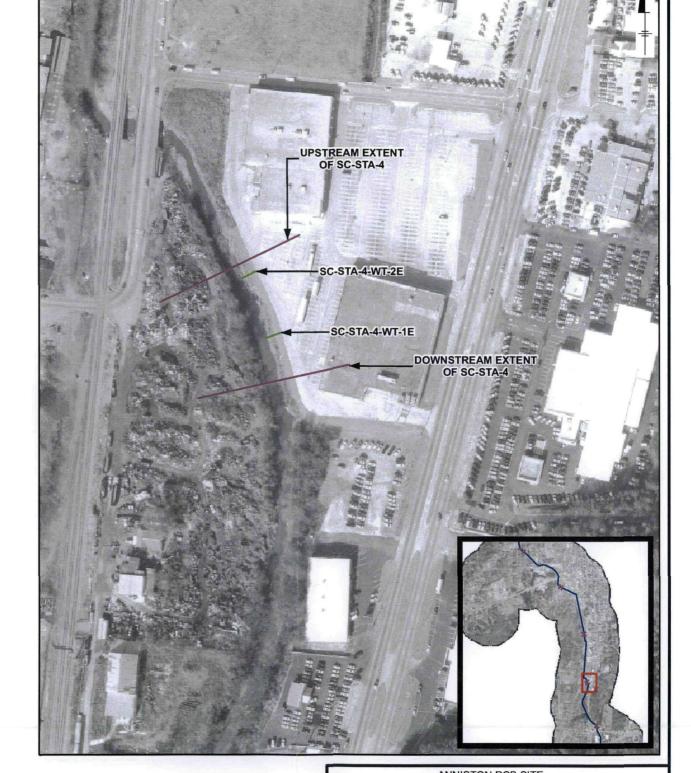
Note: 1,853 seconds of shocking in the stormwater containment structure yielded no fish

	Benthic Mad	croinvetel	brate Sum	mary Met	rics		
Metric	Expected Response	STA-1	STA-2	STA-3	STA-4	STA-5	RP-1
Total Number of Specimens	Decrease	97	106	16	28	16	331
Species Richness	Decrease	19	13	5	7	4	31
Percent EPT	Decrease	0	42	19	14	63	37
Percent Diptera	Increase	23	45	69	82	31	10

Note: Expected Response indicates the response to each metric in the presence of perturbation

#### NOTE:

ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.



#### LEGEND:

- WILDLIFE OBSERVATION TRANSECT
- SNOW CREEK SAMPLING STATION BOUNDARIES



ANNISTON PCB SITE ANNISTON, ALABAMA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

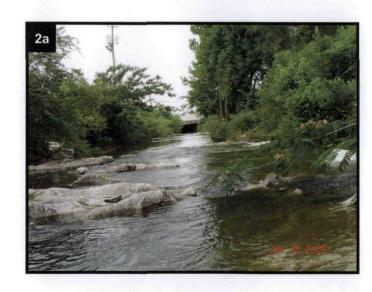
**BIOSURVEY RESULTS FOR STA-4** 



FIGURE 33

06 SYR-85 EAB iston 10206





	Fish Survey		Ве	nthic Macro	Inverteb	orate	Survey			ldlife rvations
Station		Distril	bution o	f Kicks by H	abitat Ty	ре (%	of 20 kick	(s/jabs)*		
	Total Shock Time (min)	Cobble	Snag	Vegetated Banks	Sand & Gravel	SAV	Bedrock Outcrop		Total Transect Length (ft)	Total Observation Time (min)
SC-STA-1	40	20		20	60				200	200
SC-STA-2	36	50			50				200	205
SC-STA-3	24	50			50				100	175
SC-STA-4	28	60			40				100	180
SC-STA-5*	39	31	11	8	34		8	8	100	250
RP-1	31			60		30		10	240	160

- \*- more kicks/jabs at this location SC-STA-5 "Other" was detritus/leaf litter RP-1 "Other" is emergent vegetation (Alligator weed)

1/6/06 ROCH-85 EAB
Anniston 10206
Q:\Anniston PCB Site\SLERA OU1-2-3\mxd\WildlifeTransects-STA-5-Landscape.mxd







# NOTES:

- 1. ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.
- 2. WILDLIFE TRANSECTS WERE CONDUCTED BY WALKING THE VEGETATED SLOPE PARALLEL TO SNOW CREEK DUE TO CLOSE PROXIMITY OF ASPHALT PARKING LOTS AND BUILDINGS TO THE EDGE OF THE CREEK.

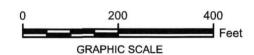
#### LEGEND:

- WILDLIFE OBSERVATION TRANSECT
- SNOW CREEK SAMPLING STATION BOUNDARIES

SC-STA-5-WT-1W-

SC-STA-5-WT-2W-

PHOTO ID AND CAMERA DIRECTION



# ANNISTON PCB SITE ANNISTON, ALABAMA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

DOWNSTREAM EXTENT

**BIOSURVEY LOCATIONS ON SNOW CREEK: STA-5** 









Habitat Parameter	S - Low Gradient Streams	Condition Catergory & Score Optimal (20 - 16) — Suboptimal (15 - 11) — Marginal (10 - 6) — Poor (5 - 0)									
Re	aches	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5					
Epifaunal Substrate	/Available Cover	8	11	17	12	17					
Pool Substrate Cha	racterization	14	8	7	8	4					
Pool Variability		3	4	8	11	15					
Sediment Depositio	n	14	12	17	14	17					
Channel Flow Statu	S	17	17	17	17	18					
Channel Alteration	A	14	17	18	18	9					
Channel Sinuosity		5	6	3	4	6					
Bank Stability	Right Bank (10 - 0)	9	9	7	10	10					
Bank Stability	Left Bank (10 - 0)	9	9	10	10	10					
Vegetative	Right Bank (10 - 0)	9	9	7	10	9					
Protection	Left Bank (10 - 0)	8	8	10	9	7					
Riparian Vegetative	Right Bank (10 - 0)	6	6	1	5	2					
Zone Width	Left Bank (10 - 0)	6	5	2	2	1					
TOTAL SCORE		122	121	124	130	125					

Note: Habitat evaluation performed using the methods outlined in the USEPA's Rapid Bioassessment Protocols for Streams and Wadable Rivers

Sanaina Observad	Count by Location							
Species Observed	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	Fish		
Largescale Stoneroller (Campostoma oligolepis)	15	21	2	70	91	199		
Eastern Mosquitofish (Gambusia holbrooki)	110	2		7		119		
Unknown Shiner #2 (Notropis spp.)		5	8	62	3	78		
Unknown Shiner #1 (Notropis spp.)		12	3	23	4	42		
Bluespotted Sunfish (Enneacanthus gloriosus)	2	18	1	5	1	27		
Unknown Shiner #3 (Notropis spp.)			7			7		
Bluegill (Lepomis macrochirus)				6		6		
Unknown Shiner (Cyprinella sp.)				3	1	4		
Creek Chub (Semotilus atromaculatus)			1			1		
Suckermouth minnow (Phenacobius mirabilis)				1		1		
Longear Sunfish (Lepomis megalotis)					1	1		
Black Redhorse (Moxostoma duquesnei)					1	1		
Yellow Bullhead (Ameiurus natalis)					1	1		
Total Fish	127	58	22	177	103	487		
Species Richness	3	5	6	8	8	13		
Total Shock Time (seconds)	2,386	2,146	1,468	1,678	2,322	10,000		
Catch per unit Effort	0.053	0.027	0.015	0.105	0.044	0.049		

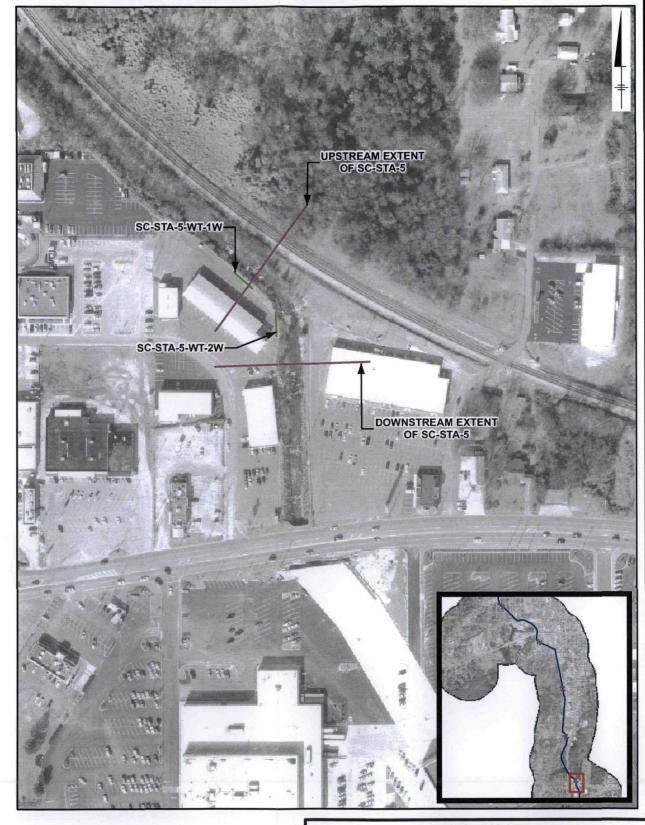
Note: 1,853 seconds of shocking in the stormwater containment structure yielded no fish

	Benthic Mad	croinvetel	orate Sum	mary Met	rics		
Metric	Expected Response	STA-1	STA-2	STA-3	STA-4	STA-5	RP-1
Total Number of Specimens	Decrease	97	106	16	28	16	331
Species Richness	Decrease	19	13	5	7	4	31
Percent EPT	Decrease	0	42	19	14	63	37
Percent Diptera	Increase	23	45	69	82	31	10

Note: Expected Response indicates the response to each metric in the presence of perturbation

#### NOTES:

- ALL BENTHOS AND FISH SAMPLING ACTIVITIES CONDUCTED WITHIN REACH BOUNDARIES.
- 2. WILDLIFE TRANSECTS WERE CONDUCTED BY WALKING THE VEGETATED SLOPE PARALLEL TO SNOW CREEK DUE TO CLOSE PROXIMITY OF ASPHALT PARKING LOTS AND BUILDINGS TO THE EDGE OF THE CREEK.





— WILDLIFE OBSERVATION TRANSECT

SNOW CREEK SAMPLING STATION BOUNDAIRES



ANNISTON PCB SITE
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SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

**BIOSURVEY RESULTS FOR STA-5** 



FIGURE 35

1/6/06 SYR-85 EAB
Anniston 10206
Q:\Anniston PCB Site\SLERA OU1-2-3\mxd\WildlifeTransects-STA-5-Tables.mxd





	Fish Survey		Ве	nthic Macro	Inverteb	orate :	Survey			ldlife rvations
Station		Distri	bution o	f Kicks by H	abitat Ty	pe (%	of 20 kick	(s/jabs)*		
	Total Shock Time (min)	Cobble	Snag	Vegetated Banks	Sand & Gravel	SAV	Bedrock Outcrop	Other - see notes	Total Transect Length (ft)	Total Observation Time (min)
SC-STA-1	40	20		20	60				200	200
SC-STA-2	36	50			50				200	205
SC-STA-3	24	50			50				100	175
SC-STA-4	28	60			40				100	180
SC-STA-5*	39	31	11	8	34		8	8	100	250
RP-1	31			60		30		10	240	160

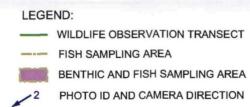
\*- more kicks/jabs at this location SC-STA-5 "Other" was detritus/leaf litter RP-1 "Other" is emergent vegetation (Alligator weed)

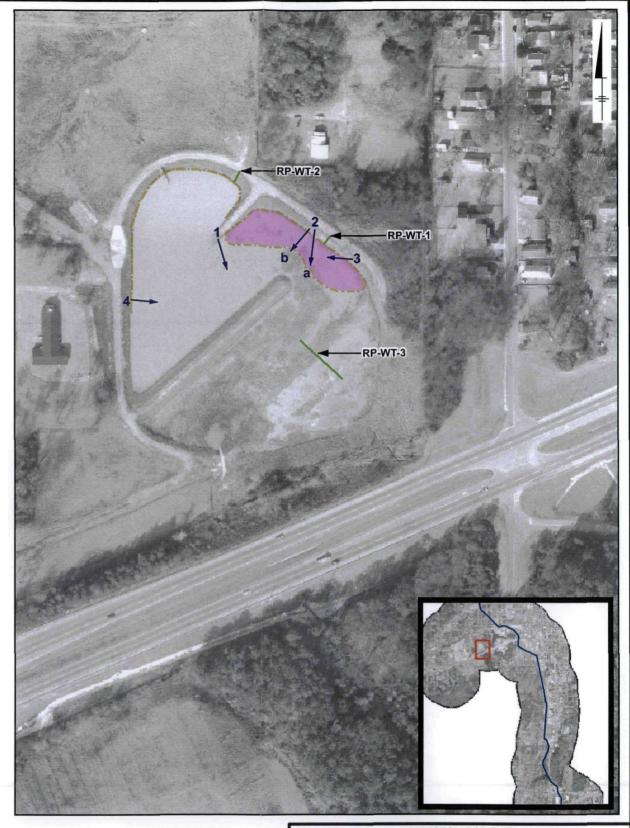
1/6/06 ROCH 85 EAB
Anniston 10206
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ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

## BIOSURVEY LOCATIONS FOR STORMWATER RETENTION STRUCTURE





	S - Low Gradient Streams	<u>Condition Catergory &amp; Score</u> Optimal (20 - 16) Suboptimal (15 - 11) Marginal (10 - 6) Poor (5 - 0)									
Re	acnes	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5					
Epifaunal Substrate/	Available Cover	8	11	17	12	17					
Pool Substrate Char	acterization	14	8	7	8	4					
Pool Variability		3	4	8	11	15					
Sediment Deposition	1	14	12	17	14	17					
Channel Flow Status	3	17	17	17	17	18					
Channel Alteration		14	17	18	18	9					
Channel Sinuosity		5	6	3	4	6					
Dank Stability	Right Bank (10 - 0)	9	9	7	10	10					
Bank Stability	Left Bank (10 - 0)	9	9	10	10	10					
Vegetative	Right Bank (10 - 0)	9	9	7	10	9					
Protection	Left Bank (10 - 0)	8	8	10	9	7					
Riparian Vegetative Right Bank (10 - 0)		6	6	1	5	2					
Zone Width	Zone Width Left Bank (10 - 0)		5	2	2	1					
TOTAL SCORE		122	121	124	130	125					

Note: Habitat evaluation performed using the methods outlined in the USEPA's Rapid Bioassessment Protocols for Streams and Wadable Rivers

Species Observed	Count by Location							
Species Observed	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	Fish		
Largescale Stoneroller (Campostoma oligolepis)	15	21	2	70	91	199		
Eastern Mosquitofish (Gambusia holbrooki)	110	2		7		119		
Unknown Shiner #2 (Notropis spp.)		5	8	62	3	78		
Unknown Shiner #1 (Notropis spp.)		12	3	23	4	42		
Bluespotted Sunfish (Enneacanthus gloriosus)	2	18	1	5	1	27		
Unknown Shiner #3 (Notropis spp.)			7			7		
Bluegill (Lepomis macrochirus)				6		6		
Unknown Shiner (Cyprinella sp.)				3	1	4		
Creek Chub (Semotilus atromaculatus)			1			1		
Suckermouth minnow (Phenacobius mirabilis)				1		1		
Longear Sunfish (Lepomis megalotis)					1	1		
Black Redhorse (Moxostoma duquesnei)					1	1		
Yellow Bullhead (Ameiurus natalis)				-0	1	1		
Total Fish	127	58	22	177	103	487		
Species Richness	3	5	6	8	8	13		
Total Shock Time (seconds)	2,386	2,146	1,468	1,678	2,322	10,000		
Catch per unit Effort	0.053	0.027	0.015	0.105	0.044	0.049		

Note: 1,853 seconds of shocking in the stormwater containment structure yielded no fish

	Benthic Mad	croinvetel	orate Sum	mary Met	rics		
Metric	Expected Response	STA-1	STA-2	STA-3	STA-4	STA-5	RP-1
Total Number of Specimens	Decrease	97	106	16	28	16	331
Species Richness	Decrease	19	13	5	7	4	31
Percent EPT	Decrease	0	42	19	14	63	37
Percent Diptera	Increase	23	45	69	82	31	10

Note: Expected Response indicates the response to each metric in the presence of perturbation

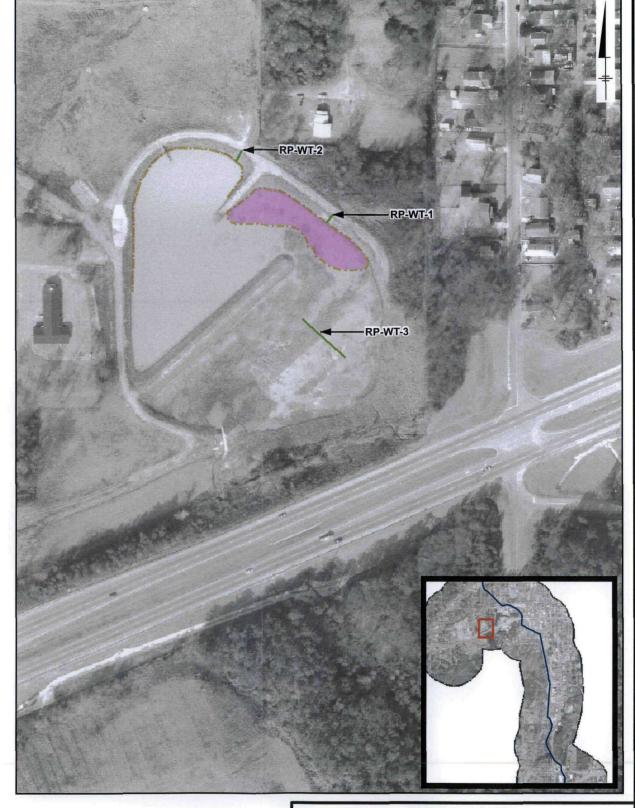
LEGEND:

WILDLIFE OBSERVATION TRANSECT

FISH SAMPLING AREA

BENTHIC AND FISH SAMPLING AREA

**GRAPHIC SCALE** 



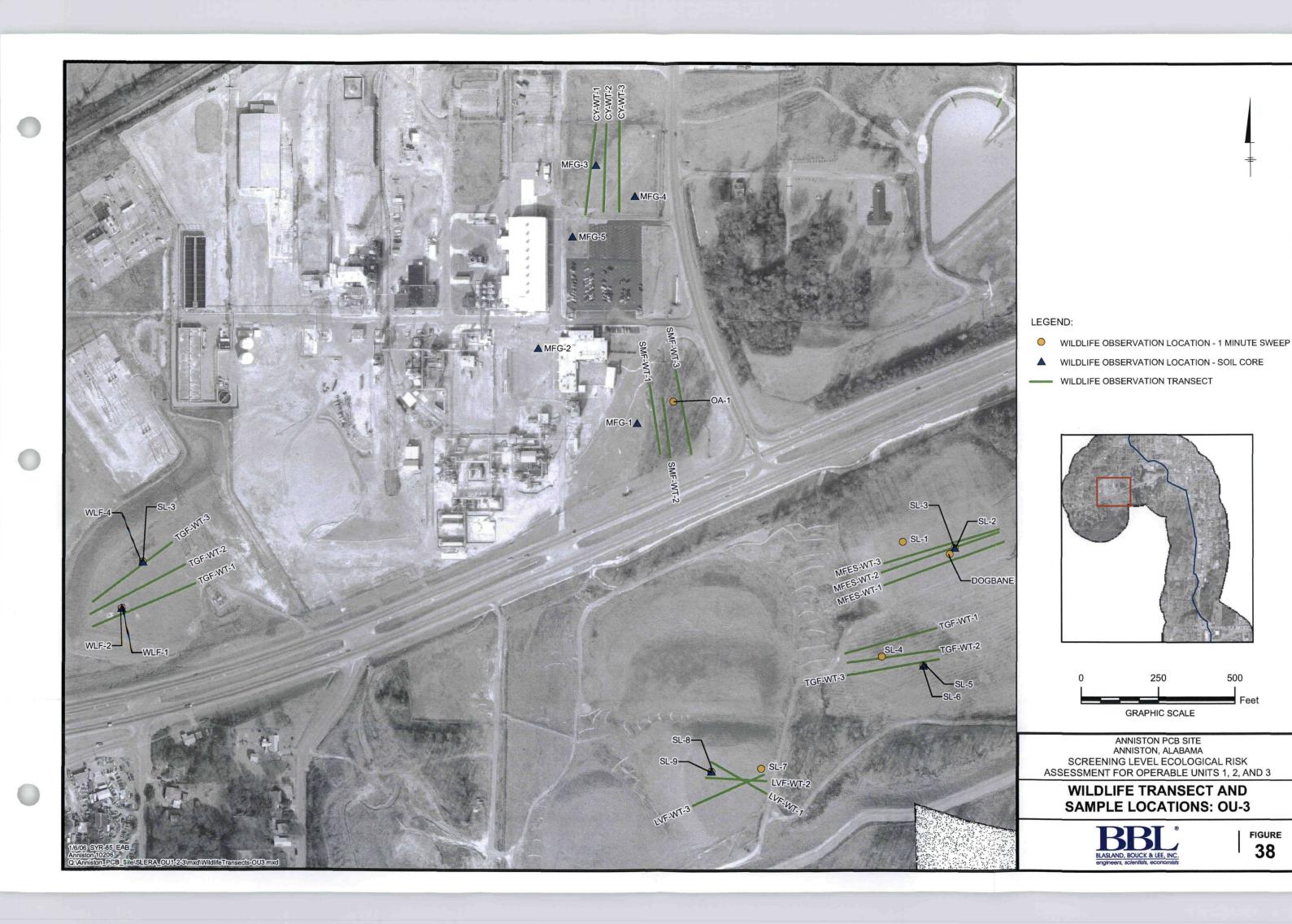
ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK
ASSESSMENT FOR OPERABLE UNITS 1, 2, AND 3

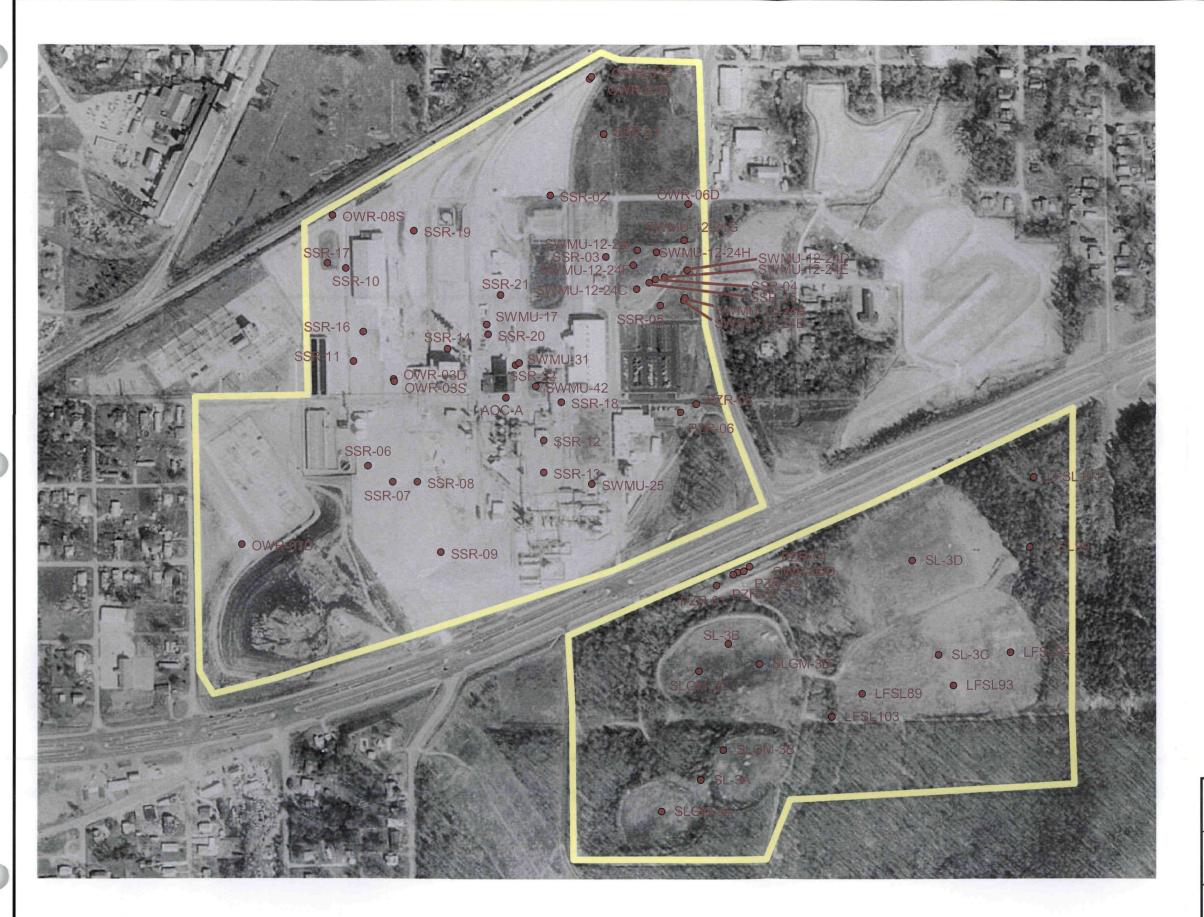
BIOSURVEY RESULTS FOR STORMWATER RETENTION STRUCTURE



FIGURE 37

1/6/06 SYR-85 EAB
Anniston 10206
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### Legend

OU-3 Sample Locations



250 0 250 500 Feet

ANNISTON PCB SITE
ANNISTON, ALABAMA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR
OPERABLE UNITS 1, 2, AND 3

OU-3 SURFACE SOIL SAMPLING LOCATIONS



FIGURE 39

01/09/06 SYR-D85-KFS, DJH 10213001/10213g01.cdr

## Appendix A

BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

### Appendix A

Field Data Sheets and Field Notes



**Stormwater Retention Basin** 



#### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	ETENTION POWD	LOCATION RP-1	
STATION #	RIVERMILE	STREAM CLASS	
LAT	LONG	RIVER BASIN	
STORET#		AGENCY	
INVESTIGATORS			LOT NUMBER
FORM COMPLETED  SPT/V	C3/SML	DATE 06/13/05 TIME 12:43 AM FM	REASON FOR SURVEY
HABITAT TYPES	Indicate the percentage o ☐ Cobble % ☐ Si ☑ Submerged Macrophytes	f each habitat type present nags% U Vegetated B 3 0 % Prother (	anks (0% Sand %  overeigent ) 10%
SAMPLE COLLECTION	Gear used D-frame  How were the samples col  Indicate the number of ja  D-Gobble D-Submerged Macrophytes	lected? Owading 🔾 fi	rom bank
GENERAL COMMENTS	Ludevigea & Allization we	10%	o in Alligator week.
-	LISTING OF AQUATION Absen		2 = Common, 3= Abundant, 4 =
Periphyton	<b>1</b>	2 3 4 Slimes	0 2 3 4
Filamentous Algae	<b>(D)</b> 1	2 3 4 Macroiny	vertebrates 0 1 2 3 4
Macrophytes	0 1	2 3 4 Fish	1 2 3 4
Indicate estimated	organism	nt/Not Observed, 1 = Rare ( s), 3= Abundant (>10 organ	(1-3 organisms), 2 = Common (3-9 issms), 4 = Dominant (>50 organisms)
Porifera		•	3 4 Chironomidae 0 1 2 3 4 3 4 Ephemeroptera 0 1 2 3 4
Hydrozoa Platyhelminthes	1 75	optera 0 1 2 <b>(</b> 3 iptera 0 1 2 <b>(</b> 3	
Turbellaria	The state of the s	optera 0 1 2 3	
Hirudinea	$\overline{}$	doptera 0 1 2 3	<b>—</b>
Oligochaeta	0 1 2 3 4 Siali	=	´
Isopoda		dakdae 0 1 2 3	
Amphipoda		lidae 0 1 2 3	j l
Decapoda	1 T	ididae 0 1 2 3	3 4
Gastropoda		oliidae 0 1 <b>2</b> 3	3 4
Bivalvia	0 1 2 3 4 Tabi	nidae 0 1 2 3	4

#### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

									_									_
STREAM NAME	SITE NAME																	
STATION#						LOC	ATION						<del></del> -					
RIVER BASIN						UPP	ER LIMIT	LAT	ITU	DE/I	ON	GIT	ЉЕ:					
AGENCY						LOW	ER LIMIT	LA′	TITU	ЉE	/LO	VGI"	TUDE:					
INVESTIGATORS						<u> </u>					Ti	TO.	NUMBER					
FORM COMPLETE	D BY					DAT TIM	E	_	AM	РМ		Œ۸S	SON FOR SURVEY					
HABITAT TYPES		Cob	ble_		%	tage of each l		$\Box v_i$	eveta	ited	Banl	(s	% □ Sand%	%				
SAMPLE COLLECTION	II.							1	<b>0</b> 0	ther			ık ☐ from bo					
		Cob	ble_		_	r of jabs/kick  Snags pphytes		O V	hab egeta □ O	ited	Banl	us						
GENERAL COMMENTS																		
								<del>.</del> , 1	= R	lare	, 2	= C	ommon, 3= Abun	dant,	4 =	=		
Indicate estimate Dominant  Periphyton Filamentous Algae	ed abu	und			0 = 0	1 2 3 1 2 3	Observed  4 4		Slin Mad	nes croin			ommon, 3= Abun	0	1 1	2 2	3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV	ed abu	ONS	ance	F M	$0 = \lambda $ $0$ $0$ $0$ $0$ $AC$ $0 = \lambda$	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHA	Observed  4 4 4 OS Observed	d, 1	Slin Mad Fish	nes eroin	nvei	tebr		0 0 0	1 1 1	2 2 2	3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV	ed abu	ONS	S OI	F M	0 0 0 0 ACI 0 = orgs	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTH Absent/Not anisms), 3=	4 4 4 4 OS Observe	d, 1	Slim Mac Fish = 1	nes croin 1 Rare	e (1	-3 or	ates rganisms), 2 = Co	0 0 0	1 1 1 m (3	2 2 2	3 3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa	ed abu	ONS	S OI ance	F M	0 0 0 0 ACI 0 = orgs	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHA Absent/Not anisms), 3=  Anisoptera Zygoptera	4 4 4 4 OS Observe Abundar	d, 1	Slim Mac Fish = 1	nes croin 1 Rare	e (1 3 3 3	-3 or	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera	0 0 0	1 1 1 m (3	2 2 2	3 3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes	ed abu	ONS Jind	S OF ance	3 3 3	0 0 0 0 ACI 0 = orgs	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHAbsent/Notanisms), 3= Anisoptera Zygoptera Hemiptera	4 4 4 4 OS Observe Abundar	d, 1 nt (>	Slim Mac Fish = 1	Rares	3 3 3	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmor 50 or	1 1 1 m (3 rgan 1 1 1 1	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria	ATIO	ONS and	2 2 2 2	F M e:	0 0 0 0 ACI 0 = org	1 2 3 1 2 3 1 2 3 ROBENTHA Absent/Not anisms), 3=  Anisoptera Zygoptera Hemiptera Coleoptera	4 4 4 4 OS Observe Abundar	d, 1 0 0 0	Slim   Mac   Fish	Rarorg:	3 3 3 3	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera	0 0 0 0 mmo 50 or	1 1 1 m (3 rgan 1 1	2 2 2 2 -9 nism 2 2	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea	ATIO	ONS und	2 2 2 2 2	3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHA Absent/Not anisms), 3=  Anisoptera Zygoptera Hemiptera Coleoptera Lepidopter	4 4 4 4 OS Observe Abundar	0 0 0 0	Slim Mac Fish  1 1 1 1	Rarcorg:	3 3 3 3 3	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmor 50 or	1 1 1 m (3 rgan 1 1 1 1	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta	O O O O O	ONS and	2 2 2 2 2 2	3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHAbsent/Notanisms), 3=  Anisoptera Zygoptera Hemiptera Coleoptera Lepidopter Sialidae	4 4 4 OS Observe Abundar	d, 1 (>	Slin Mac Fish  1 1 1 1 1	Rare 2 2 2 2 2 2 2	3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmor 50 or	1 1 1 m (3 rgan 1 1 1 1	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda	ed abu	ONS Jind 1 1 1 1 1 1	2 2 2 2 2 2 2	3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHA Absent/Not anisms), 3=  Anisoptera Zygoptera Hemiptera Coleoptera Lepidopter Sialidae Corydalidae	4 4 4 OS Observe Abundar	d, 1 0 0 0 0 0	Slim   Mac   Fish	Rarcorg:	3 3 3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmor 50 or	1 1 1 m (3 rgan 1 1 1 1	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	ed abu	ONS and 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHAbsent/Notanisms), 3=  Anisoptera Zygoptera Hemiptera Coleoptera Lepidopter Sialidae Corydalida Tipulidae	Observed  4 4 4 OS Observed Abundar	0 0 0 0 0 0 0	Slim   Mac   Fish	Rare org:	3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmor 50 or	1 1 1 m (3 rgan 1 1 1 1	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda Decapoda	e e VATIC dabu	DNS 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHAbsent/Notanisms), 3=  Anisoptera Zygoptera Hemiptera Coleoptera Lepidopter Sialidae Corydalida Tipulidae Empididae	Observed  4 4 4 OS Observed Abundar	0 0 0 0 0 0 0	Slim   Mac   Fish	Rarcorg:  2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmor 50 or	1 1 1 m (3 rgan 1 1 1 1	2 2 2 2 nism	3 3 3 3 3	4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	ed abu	ONS and 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 1 2 3 1 2 3 1 2 3 ROBENTHAbsent/Notanisms), 3=  Anisoptera Zygoptera Hemiptera Coleoptera Lepidopter Sialidae Corydalida Tipulidae	Observed  4 4 4 OS Observed Abundar	0 0 0 0 0 0 0	Slim   Mac   Fish	Rare org:	3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmor 50 or	1 1 1 m (3 rgan 1 1 1 1	2 2 2 2 nism	3 3 3 3 3	4 4 4 4

#### Benthic Macroinvertebrates Collected by BBL Science for Project Number 10213.001.

Sample Location: Sample Date: Sample Type:	Station RP-01 13-Jun-05 Kick Net		
Taxon:	Common Name	Number	Percent
Rhyncobdellida			
Glossiphoniidae	1		
Helobdella papillata	leech	2	0.6%
Hydrachnidia	1		
Limnesiidae	<u>.</u>		
Limnesia sp.	mite	13	3.9%
Ephemeroptera			
Baetidae <i>Callibaetis sp</i> .	mayfly	120	36.3%
Caenidae  Caenidae	mayny	120	30.376
Caenis sp.	mayfly	3	0.9%
Odonata			
Aschnidae	1		
Aeschna sp.	dragonfly	8	2.4%
Anax sp.	dragonfly	1	0.3%
Coenagrionidae	damaald	54	16.3%
Enallagma sp. Libellulidae (early instar)	damselfly dragonfly	54 1	0.3%
Erythemis simplicollis	dragonfly	3	0.5%
Hemiptera	i	,	0.770
Belostomatidae			
Belostoma sp.	giant water bug	4	1.2%
Corixidae	1		
Hesperocorixa sp.	water boatman	1	0.3%
<i>Sigara sp.</i> Gerridae	water boatman	2	0.6%
Gemaae Gerris sp.	water strider	2	0.6%
Mesoveliidae	water strider	2	0.070
Mesovelia mulsanti	water treader	6	1.8%
Naucoridae	ı		
Pelocoris femoratus	creeping water bug	9	2.7%
Notonectidae			
Notonecta indica	back swimmer	36	10.9%
Coleoptera	1		
Dytiscidae <i>Ilybius sp</i> .	diving beetle	5	1.5%
Haliplidae	diving beene	J	1.570
Haliplus sp.	crawling water beetle	2	0.6%
Peltodytes sp.	crawling water beetle	1	0.3%
Hydrophilidae	_		
Berosus sp.	scavenger beetle	1	0.3%
Tropisternus sp.	scavenger beetle	22	6.6%
Noteridae <i>Hydrocanthus sp</i> .	burrowing water beetle	1	0.3%
Diptera	burrowing water beetle	1	0.376
Ceratopogonidae			
Palpomyia gr.	biting midge	4	1.2%
Chaoboridae			
Chaoborus punctipennis	phantom midge	1	0.3%
Chironomidae		_	
Cricotopus bicinctus	midge	1	0.3%
Endochironomus nigricans	midge midge	6 10	1.8%
Larsia sp. Parachironomus chaetoalus	midge midge	5	3.0% 1.5%
Paratanytarsus sp.	midge	l	0.3%
Culicidae	250	•	0.570
Culex sp.	mosquito	5	1.5%
Stratiomyiidae	•		
Odontomyia sp.	soldier fly	1	0.3%
Total Number of Specimens		331	100.0%
Total Number of Taxa	1	31	

#### FISH SAMPLING FIELD DATA SHEET (FRONT)

									pa	ge_		of	
STREAM NAME			SITE NAM	Œ									
STATION#			LOCATIO	N									
RIVER BASIN			STATION-	CENTER LAT	ITUDE/	LONG	ITUD	E:					
AGENCY			LOWER L	IMIT LATITU	DE/LON	GITU	DE:						
GEAR			INVESTIG	ATORS	·								
FORM COMPLETED	BY		DATETIME	AM		ASON F	OR SUR	VEY				_	
SAMPLE COLLECTION	How were the Block nets use Sampling Dura	d?	time	O End ti	ime		_						
HABITAT TYPES	Indicate the pe	ercentage of % • Pools_ Macrophytes_	each habitat	t type present  Runs	% □ Sna	ngs	_%	1					
GENERAL COMMENTS													
SPECIES	TOTAL	OPTIONAL	L: LENGTH	(mm)/WEIG	HT (g)			Al	NOM	ALIE	s*		
	(COUNT)			X SÚBSAMP			[ [	F			ı	Т	T.,
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#### FISH SAMPLING FIELD DATA SHEET (BACK)

SPECIES	TOTAL	OPTIONAL: LENGTH (mm)/WEIGHT (g)	ANOMALIES*								
	(COUNT)	(25 SPECIMEN MAX SUBSAMPLE)	D	E	F	L	М	s	Т	Z	
THE SECOND CONTRACT OF THE SECOND	The transfer and		Emerce	द. इक्ट ५५वे	ক্রেক্ট ক	े <b>क</b> िस्ट	SETTINGS	(3) (Z)	7 7 ET 0	7095	
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**Snow Creek Station 1** 



# WHA 33 39 40 7" 85 50 51.7" top 33 39 43.2" 85 50 55.5"

#### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	SNOW (REEK	LOCATION	STATIO	N/REACH	<u>1 - </u>	14th + Mc
STATION#	RIVERMILE	STREAM CL.				
LAT	LONG	RIVER BASII	4			
STORET#		AGENCY				
INVESTIGATORS			I	OT NUMBER		
FORM COMPLETED	MY SPT JOKS	DATE 616 TIME (Q1	AM PM	LEASON FOR SURV	EY	
HABITAT TYPES	Indicate the percents Cobble 20 % Submerged Macrop	O Snags%	pe present  Vegetated Bank Other (	is <u> <b>40</b></u> % <b>■</b> Sar	weil 60%	
SAMPLE	Gear used 🗆 D-fras	ne 🏋 kick-net	Other			
COLLECTION	How were the sample	- \	vading 🖸 fron	hank Differ	n boat	•
	Indicate the number Cobble 4 Submerged Macrop	☐ Snags			<u> 12</u>	
GENERAL COMMENTS	Flow 1.13 ( See field	it/sec nolabada	for resu	ut for	I / pm	Treen
	LISTING OF AQUA abundance: 0 = Al		d, 1 = Rare, 2	= Common, 3= A	bundant,	4 =
Periphyton		1 2 3 4	Slimes		0	1 2 3 4
	(0)	1 2 3 4	Macroinver	tebrates	0	1 2 3 4
Macrophytes	<u> </u>	1/2/3 4	Fish		0	1 2 3 4
Dominant Periphyton Filamentous Algae Macrophytes FIELD OBSERVA	ATIONS OF MACRO	1 2 3 4 1 2 3 4 1 2 3 4 DBENTHOS	Slimes Macroinver Fish ed, 1 = Rare (1-	tebrates 3 organisms), 2 =	0 0	1 2 3 1 2 3 1 2 3
			and to pr Panis		- ( 50 01)	5 <i>-</i>
Porifera .	0 1 2 3 4 .	Anisoptera	0 1 💋 3	4 Chironomidae	0 (	$\bigcirc 2  3  4$

											· ·					
Porifera.	0 1	2	3	4	Anisoptera	0	1	<b>②</b>	3	4	Chironomidae	0	Q	$\overline{)_2}$	3	4
Hydrozoa	0 1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0 1	2	- 3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	ı	2	3	4
Turbellaria	0 1	2	3	4	Coleoptera	0 (	O	2	3	4	Other	0	1	0	3	4
Hirudinea	0 _1	2	3	4	Lepidoptera	0	1	2	3	4	Fish Fry					
Oligochaeta	○ <b>(</b> )}	2	3	4	Sialidae	0	l	2	3	4	,					
Isopoda	$0 \underbrace{}{1}$	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0 1	2	3	4	Tipulidae	0	1	2	3	4	•					ı
Decapoda	0 1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0 1	2	<i>[3]</i>	4	Simuliidae	0 (		2 (	3	4						
Bivalvia	0 1	2	3	4	Tabinidae	0	Ĭ	2	3	4						
					Culcidae	0	1	2	3	4						_}

#### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME						SITE NA	ME										
STATION#						LOCATI	ION										
RIVER BASIN						UPPER I	LIMIT LAT	TTU	DE/L	Ю	GIT	JDE:					
AGENCY						LOWER	LIMIT LA	TIT.	ЉЕ/	LO	NGIT	UDE:					
INVESTIGATORS						<del></del>				Τι	то.	NUMBER					
FORM COMPLETE	O BY				_	DATE				R	EAS	ON FOR SURVEY					
						TIME		AM	PM	L							
HABITAT TYPES	<b>∥</b> □ :	Cob	ble_		%	tage of each habi	% ¨□`v	egeta	ited I	Bank	:s	%	%				
SAMPLE COLLECTION	Ge	arı	ısed	٥	D-fr	ame Dkick-net							-	-			
	He	)W V	vere	the	samp	oles collected?	uadin 🔾	g		fron	n ban	k 🗅 from bo	at				
	Ind	dica Cob Sub:	te th	e nu	imbe Jacro	r of jabs/kicks tal Snags phytes	ken in eacl	hab egeta	itat ( ited l	t <b>ype</b> Bank (	us	Sand )					
GENERAL COMMENTS				<u>.</u>						<u> </u>		<del></del>					
QUALITATIVE Indicate estimate Dominant								= F	lare	, 2	= C	ommon, 3= Abur	dant,	4=			
Indicate estimate	d abu				0 0	1 2 3 4 1 2 3 4	served, 1	Slin	nes			ommon, 3= Abur	0	1 1	2 2	3	4
Indicate estimate Dominant  Periphyton	d abu				0 0	1 2 3 4	served, 1	Slin	nes croir	iver	tebr	·	0	1 1	2	3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate	ATIC	)NS	S Ol	F M	0 0 0 0 ACI 0 = orgs	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Obanisms), 3= Ab	served, l	Slin Mac Fish 1 = 1 >10	nes croir n Rare	e (1-	-3 oi ms)	ates ganisms), 2 = Co , 4 = Dominant (>	0 0 0	1 1 1	2 2 2	3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera	ATIC d abu	ONS	S Olanco	F M e:	0 0 0 0 ACI 0 = org3	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Ob anisms), 3= Ab	oserved, lundant (	Slin Mac Fish 1 = 1 10	nes 1 Rare	(1-anis	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (> Chironomidae	0 0 0 0 0 0 0 0 0 0	1 1 1 1 m (3 rgan	2 2 2 2 -9 nism	3 3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa	ATIC d abu	ONS inda	S Olanco	F M e: 3	0 0 0 0 0 ACI 0 = org:	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Obanisms), 3= Ab Anisoptera Zygoptera	oserved, oundant (	Stir Mac Fish 1 = 1 >10	nes  Rare orga	3 3	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera	0 0 0 0 0 0 0 0 0 0	1 1 1 m (3	2 2 2 2 -9 nism	3 3 3 3	4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes	ATIC 0 0 0	DNS ind:	S Olanco	F M e:	0 0 0 0 0 ACI 0 = org:	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Obanisms), 3= Ab Anisoptera Zygoptera Hemiptera	oserved, ose	Shin Mac Fish 1 = 1 >10	Rare orga	3 3 3	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (> Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0-50 o	1 1 1 m (3 rgan	2 2 2 2 -9 nism 2 2 2	3 3 3 3 3	4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria	ATIC 0 0 0	ONS ind:	2 2 2 2	F M ee:	0 0 0 0 0 0 0 0 0 0 4 4 4 4	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Obanisms), 3= Ab Anisoptera Zygoptera Hemiptera Coleoptera	oserved, loserved, undant (	Slin Mac Fish 1 = 1 1 1 1	Rareorga 2 2 2 2	3 3 3 3	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera	0 0 0 0 0 0 0 0 0 0	1 1 1 1 m (3 rgan	2 2 2 2 -9 nism	3 3 3 3	4 4 4
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Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda	ATIC d abu	DNS ind: 1 1 1 1 1	2 2 2 2 2 2 2	F M e:	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Obanisms), 3= Ab Anisoptera Zygoptera Hemiptera Coleoptera Lepidoptera Sialidae Corydalidae	oserved, oo	Shirn Mad Fish 1 = 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Rares 2 2 2 2 2 2 2	3 3 3 3 3 3	3 on ms) 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (> Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0-50 o	1 1 1 m (3 rgan	2 2 2 2 -9 nism 2 2 2	3 3 3 3 3	4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	ATIC 0 0 0 0 0 0	1 1 1 1 1 1	2 2 2 2 2 2 2 2	F M e:	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Obanisms), 3= Ab  Anisoptera Zygoptera Hemiptera Coleoptera Lepidoptera Sialidae Corydalidae Tipulidae	oserved, loserved, oundant (so	Stirr Mad Fish 1 = 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Rare 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3	-3 onms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (> Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0-50 o	1 1 1 m (3 rgan	2 2 2 2 -9 nism 2 2 2	3 3 3 3 3	4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochacta Isopoda Amphipoda Decapoda	0 0 0 0 0 0 0	DNS ind: 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Obanisms), 3= Ab  Anisoptera Zygoptera Hemiptera Coleoptera Lepidoptera Sialidae Corydalidae Tipulidae Empididae	oserved, 1  oserved, 1  oo 0	Slin Mac Fish  1 = 1   1   1   1   1   1   1   1   1	Rare 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (> Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0-50 o	1 1 1 m (3 rgan	2 2 2 2 -9 nism 2 2 2	3 3 3 3 3	4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	ATIC 0 0 0 0 0 0	1 1 1 1 1 1	2 2 2 2 2 2 2 2	F M e:	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 ROBENTHOS Absent/Not Obanisms), 3= Ab  Anisoptera Zygoptera Hemiptera Coleoptera Lepidoptera Sialidae Corydalidae Tipulidae	oserved, loserved, oundant (so	Shirn Made Fish  1 = 1  1	Rare 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3	-3 onms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (> Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0-50 o	1 1 1 m (3 rgan	2 2 2 2 -9 nism 2 2 2	3 3 3 3 3	4 4 4

#### Benthic Macroinvertebrates Collected by BBL Science for Project Number 10213.001.

Sample Location: Sample Date: Sample Type:	Station SC-1 10-Jun-05 Kick Net		
Taxon:	Common Name	Number	Percent
Tubificida	· · · · · · · · · · · · · · · · · · ·		
Tubificidae			
Bothrioneurum vejdovskyanur	n tubeworm	1	1.0%
Branchiura sowerbyi	tubeworm	3	3.1%
Ilydrilus templetoni	tubeworm	1	1.0%
Limnodrilus sp.	tubeworm	23	23.7%
Basommatophora			
Ancylidae			
Ferrissia rivularis	limpet snail	3	3.1%
Lymnaeidae		:	0.0%
Fossaria sp.	pond snail	3	3.1%
Physidae	•		
Physa sp.	pouch snail	9	9.3%
Veneroida	-		
Sphaeriidae			
Pisidium sp.	pill clam	3	3.1%
Decapoda	-		
Cambaridae			
Orconectes sp.	crayfish	1	1.0%
Odonata			
Aschnidae			
Aeschna sp.	dragonfly	6	6.2%
Coenagrionidae			
Enallagma sp.	damselfly	7	7.2%
Ischnura sp.	damselfly	14	14.4%
Coleoptera			
Haliplidac			
Peltodytes sp.	crawling water beetle	1	1.0%
Diptera	i		
Chironomidae			
Chironomus sp.	midge .	1	1.0%
Natarsia sp.	midge	3	3.1%
Phaenopsectra obedians gr.	midge	3	3.1%
Stictochironomus sp.	midge	2	2.1%
Tanypus sp.	midge	1	1.0%
Thienemannimyia gr.	midge	12	12.4%
Total Number of Specimens		97	100.0%
Total Number of Taxa		19	

#### FISH SAMPLING FIELD DATA SHEET

										pa	ge _		_of_	
STREAM NAME			SITE	NAME										
STATION#			LOCA	ATION										
RIVER BASIN			UPPE	R LIMIT	LATITUE	E/LON	GITUI	DE:						
AGENCY			LOW	ER LIMIT	r Latitui	DE/LON	IGITUI	DE:				-		
GEAR			INVE	STIGATO	ORS			_						
FORM COMPLETED	BY		DATE TIME	<u> </u>	AM 1	ŀ	ASON F	OR SUR	VEY				·	
SAMPLE COLLECTION	How were the	fish capture	d? □ b:	ack pack	tote 🔾	barge			O ot	her				
	Block nets use	d? 🔾 YE	ES	□ NO										
	Sampling Dur	ation Start	time		End ti	me		-	Dura	ation _	-			
	Stream width	(in meters)	Max	·	Mean_									
HABITAT TYPES	Indicate the pe □ Riffles □ Submerged N	% 🗖 Pools	%	🗅 Rı	uns %	6 □ Sna	ags	_%	ı					
GENERAL COMMENTS								_						
SPECIES	TOTAL (COUNT)	OPTIONAL			n)/WEIGI IUBSAMP				Al	NOM	ALIES	3		
	(CODIVI)	(23316	CIME	· MAX S	C BSAMI		D	E	F	L	М	S	Т	Z
	! [								l		ł			

### PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME SUIT	w cretok	LOCATION	SC.	-574(
STATION#R	IVERMILE	STREAM CLA	SS	V
LATLC	ONG	RIVER BASIN		
STORET#		AGENCY		
INVESTIGATORS .				·
FORM COMPLETED BY	KSSOT	DATE 06/13 TIME 7400	AM PM	
WEATHER CONDITIONS	rain ( showers  60 % Second	(heavy rain) steady rain) c (intermittent) oud cover ar/sunny	Past 24 hours	Has there been a heavy rain in the last 7 days?  WYes No  Air Temperature 55°C  Other
SITE LOCATION/MAP		.**	્યુ <b>પ</b>	npled (or attach a photograph)
	Sus	ligater eu	. <i>41</i>	
Gill.				
STREAM CHARACTERIZATION	Stream Subsystem Perennial Inte Stream Origin Glacial Non-glacial montane Swamp and bog	rmittent 🗆 Tida  Spring-fee  Mixture o	j	Stream Type Coldwater  Catchment Areakm²

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse    Forest	Local Watershed MYS Pollution  O No evidence O Some potential sources  O Obvious sources  Local Watershed Erosion  W None O Moderate O Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dom  Trees  dominant species present	inant species present Grasses  Herbaceous
INSTREAM FEATURES	Estimated Reach Lengthm  Estimated Stream Widthm  Sampling Reach Area	Canopy Cover Partly open Partly shaded  High Water Mark Proportion of Reach Represented by Stream Morphology Types Riffle Pool % Channelized Pyes No Dam Present Partly shaded Sh
LARGE WOODY DEBRIS	LWD m²	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant Rooted submergent Rooted Submergent Attached Algae dominant species present Alligation  Portion of the reach with aquatic vegetation 35	Rooted floating Free floating
WATER QUALITY  Serial land	Temperature^C Specific Conductance Dissolved Oxygen pH Turbidity WQ Instrument Used	Water Odors  Normal/None
SEDIMENT/ SUBSTRATE	Odors  W Normal	Deposits  Sludge Sawdust Paper fiber Sand Cother  Looking at stones which are not deeply embedded, are the undersides black in color?
	MAbsent □ Slight □ Moderate □ Profuse  Profuse	☐ Yes ☐ No

INO	RGANIC SUBSTRATE (should add up to		ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)								
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area						
Bedrock			Detritus	sticks, wood, coarse plant	10						
Boulder	> 256 mm (10*)		]	materials (CPOM)	10						
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic	-0-						
Gravel	2-64 mm (0.1"-2.5")	30	1	(FPOM)							
Sand	0.06-2mm (gritty)	460	Marl	grey, shell fragments	1						
Silt	0.004-0.06 mm 0		}		1_0-						
Clay	< 0.004 mm (slick)		]								

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME SNOW CALL	LOCATION SC-STA
STATION # RIVERMILE	STREAM CLASS
LATLONG	RIVER BASIN
STORET#	AGENCY
INVESTIGATORS	
FORM COMPLETED BY  SML/JKS/SPT	DATE 06/12/05 REASON FOR SURVEY

	Habitat Parameter		Condition	Category	
	rarameter	Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
react	SCORE X				
in sampling reach	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
fed	SCORE 14		Enter/enterpressions		11.7.5.7.5
Parameters to be evaluated in	3. Pool Variability	Even mix of large- shallow, large-deep, small-shallow, small- deep pools present.	Majority of pools large- deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small- shallow or pools absent.
fers	score 3				
Parame	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
{	SCORE 4				
{	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
1 (	SCORE 1	Single Park Control			

56

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter		Condition	n Category	
Farameter	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; ove 80% of the stream read channelized and disrupted. Instream habitat greatly altered removed entirely.
SCORE			(d) (d) (d) (1) (d)	
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
score 5	in visite to the said	HERE THE STATE OF THE	TO SEE MARKING	identification
SCORE 9 (LB) SCORE 9 (RB)  9. Vegetative Protection (score each bank)  Note: determine	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many crode areas; "raw" areas frequent along straigh sections and bends; obvious bank sloughir 60-100% of bank has erosional scars.
$\begin{array}{c} \text{SCORE } \underline{9} \text{ (LB)} \\ \text{SCORE } \underline{9} \text{ (RB)} \end{array}$				
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation disruption of streamba vegetation is very high vegetation has been removed to 5 centimeters or less it average stubble height
SCORE (LB)		A FIRST		
SCORE (RB)				
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE (LB) SCORE (RB)				PESSAT

Total Score <u>56+66</u> (= 122)

**Snow Creek Station 2** 



850 501 10.4

#### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME 5	now creek	LOCATION SC-SI	r# 2
STATION #	RIVERMILE	STREAM CLASS	
LAT	LONG	RIVER BASIN	
STORET#		AGENCY	
INVESTIGATORS			LOT NUMBER
FORM COMPLETED	L/JUS/SPT	DATE 6/10/05 TIME AM PM	REASON FOR SURVEY
HABITAT TYPES	Indicate the percentage of Cobble 50% Sn.  Submerged Macrophytes_	each habitat type present ags%	enks%
SAMPLE COLLECTION	How were the samples coll	ected? wading from the skicks taken in each babitat typags Vegetated Ball Other (	om bank 🔘 from boat
GENERAL COMMENTS		UN: 5AND/RO FORE: ROCK/B NOTOBOOK FOR	OK MIX LE BINDOOK BINDI RESULTS
-	ISTING OF AQUATIC abundance: 0 = Absent		2 = Common, 3= Abundant, 4 =

Dominant

Periphyton	6)	1 2	3	4	Slimes	(g)	1 2	3	4
Filamentous Algae	_o (	<u>)</u> 2	3	4	Macroinvertebrates	0	1 6	<b>9</b> 3	4
Macrophytes	(0)	<u>1 2</u>	: 3	4	Fish	0	1/2	3	4

#### FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0 1	0	3	4	Chironomidae	0	熮	12/	3) 4
Hydro20a	0	1	2	3	4	Zygoptera	0 1	2	3	4	Ephemeroptera	0	Z	) i (	<b>3</b> ) 4
Platyhelminthes	0	1	2	3	4	Hemiptera	0 1	_ 2	3	4	Trichoptera	0	1	2	3 4
Turbellaria	0	l	2	3	4	Coleoptera	0 (1	<b>)</b> 2	3	4	Other	0	1	2	3 4
Hirudinea	0	1	2	3	4	Lepidoptera	0 1	2	3	4					
Oligochaeta	0	(1)	2	3	4	Sialidae	0 1	2	3	4					
Isopoda	0	ĭ	2	3	4	Corydalidae	0 1	2	3	4					
Amphipoda	0	1	2	3	4	Tipulidae	0 1	2	3	4					
Decapoda	0	1	2	3	4	Empididae	0 1	2	3	4	54				
Gastropoda	0	1	2	3	4	Simuliidae	0 (1	2	3	4					
Bivalvia	0	1	2	3	4	Tabinidae	0 1	2	3	4					
_						Culcidae	0 1	_2_	.3	4					

## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME							SITEN	NAME											
STATION#							LOCA	TION											
RIVER BASIN							UPPER	R LIMIT	LAT	UTT	DE/I	LON	GIT	JDE:					
AGENCY	,	LOWER LIMIT LATITUDE/LONGITUDE:								TUDE:									
INVESTIGATORS												ı	TO	NUMBER					
FORM COMPLETED	BY						DATE TIME			ΑМ	РМ		REAS	SON FOR SURVEY				·	
HABITAT TYPES	0	Cob	ble_		%	tage of Sna	ags	bitat typ _%	ον	eget	t ated ther	Ban (	ks	%	%				
SAMPLE COLLECTION	ł							et _											
	He	)W	vere	the	samp	oles coll	ected?	Dи	radin	g		fror	n bau	ık 🖸 from bo	at				
	∥ □	Cob	ble			O Sna	12S	taken in —	O V	eget	oitat ated other	Ban	ks						
GENERAL COMMENTS														·					
QUALITATIVE I									d, 1	= 1	Rare	e, 2	= C	ommon, 3= Abun	ıdant,	4 :	=		
	l abu				0 = 0	Absent.		bserve	d, 1	Slii	nes			ommon, 3= Abur	0	1	2	3 3	
Indicate estimated Dominant  Periphyton	l abu				0 0 0	1 2 1 2	/Not O	bserve 4 4	d, 1	Slii	nes croi			·	0 0	1	2 2	_	4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated	ATIC	ONS	S Ol	F M	0 0 0 0 ACI 0 = orgs	l 2 l 2 l 2 ROBER	3 4 3 4 3 4 NTHO:	4 4 4 5 Observe	ed,	Slii Ma Fis 1 = >10	nes croi h Rar org	nve e (1	-3 o	rganisms), 2 = Co , 4 = Dominant (>	0 0 0	1 1 1	2 2 2	3 3	4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated	ATIC Labu	ONS and	S Ol	F M e:	0 0 0 0 ACI 0 = org:	l 2 l 2 l 2 l 2 ROBE: Absentanisms	3 4 3 4 3 4 NTHO:  t/Not CO ), 3= A	4 4 4 5 Observe	ed, ;	Slii Ma Fis 1 = >10	mes croi h Rar org	nve e (1 anis	rtebi	rganisms), 2 = Co , 4 = Dominant (>	0 0 0	1 1 1 m (3	2 2 2 -9 nisn	3 3	4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa	ATIC I abu	ONS ind	S Olanco	F M 8:	0 0 0 0 ACI 0 = org:	1 2 1 2 1 2 ROBER Absentanisms	3 4 3 4 3 4 NTHO:  t/Not O  ptera  ptera	4 4 4 5 Observe	ed, :: 0 0	Slin Ma Fis: 1 = >10	mes croi h Rar org	nve e (1 anis	-3 o ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae  Ephemeroptera	0 0 0 0 0 0 0 0	1 1 1 1 (3 rga	2 2 2 2 -9 nisn	3 3 3 3 3	4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated Porifera Hydrozoa Platyhelminthes	ATIC I abu	ONS ind	S Olanco	F M e:	0 0 0 0 ACI 0 = org:	l 2 l 2 l 2 l 2 ROBER Absentanisms  Anisc Zygo Hemi	3 4 3 4 3 VNTHO:  VNot C ), 3= A  optera ptera ptera	4 4 4 5 Observe	ed, and (2)	Sliii Ma Fis  1 = >10	Rar org	nve e (1 anis	-3 o ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4 4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria	ATIC I abu	ONS ind	S Olanco	F M e: 3 3 3 3	0 0 0 0 0 0 0 0 0 0 4 4 4 4	l 2 l 2 l 2 l 2 ROBERADSENISMS  Anisca Zygor Hemic Colect	3 4 3 4 NTHO: t/Not C ), 3= A  optera ptera ptera optera	4 4 4 S Observe	ed, and (2)	Slin Ma Fis 1 = 1 1 1 1 1 1	mes croi h Rar org	nve  e (1 anis	-3 o ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae  Ephemeroptera	0 0 0 0 0 0 0 0	1 1 1 1 (3 rga	2 2 2 2 -9 nisn	3 3 3 3 3	4 4 4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea	ATIC I abu	DNS ind  1 1 1 1 1	2 2 2 2 2	3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 l 2 l 2 l 2 ROBE: Absentanisms  Anisca Zygoo Hemi Colect	NTHO  NTHO  t/Not C  ), 3= A  pptera  ptera  ptera  ptera  ptera  loptera	4 4 4 S Observe	ed, 7000000000000000000000000000000000000	Slin Ma Fis  1 = >10	nes croi h Rar org	nve e (1 anis	-3 o ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4 4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta	ATIC I abu	DNS ind 1 1 1 1 1	2 2 2 2 2 2	3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 l 2 l 2 l 2 l 2 l September 1 2 l 2 l 2 l 2 l 2 l 2 l 2 l 2 l 2 l 2 l	3 4 3 4 3 4 NTHO t/Not CO), 3= A optera ptera optera loptera lae	4 4 4 S Observe	0 0 0 0 0	Slin Ma Fis	Rarrorg  2 2 2 2 2 2	e (1 anis	-3 o ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4 4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochacta Isopoda	0 0 0 0 0 0	DNS ind 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2	3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 l 2 l 2 l 2 ROBER Absentanisms  Anisc Zygor Hemi Colec Lepid Sialid Coryc	3 4 3 4 3 4 NTHO: t/Not CO), 3= A  optera ptera ptera ptera ptera dalidae	4 4 4 S Observe	ed, nt (2	Slin Ma Fis 1 = >10	Rar org	3 3 3 3 3 3 3	-3 o ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4 4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	0 0 0 0 0 0	DNS ind  1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2	F M e:	0 0 0 0 0 0 0 0 0 4 4 4 4 4 4 4 4 4	l 2 l 2 l 2 l 2 l 2 l 2 l September 1 l 2 l Coryo l Coryo l Tipul	3 4 3 4 3 4 NTHO: t/Not Co), 3= A  optera ptera ptera ptera loptera dalidae idae	4 4 4 S Observe	0 0 0 0 0 0	Slin Ma Fis 1 = >10   1   1   1   1   1   1   1   1   1	Rar org	nve e (1 anis	-3 o ms) 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4 4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda Decapoda	0 0 0 0 0 0 0	DNS ind   1	2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 l 2 l 2 l 2 ROBER Absentanisms  Anisca Zygor Hemi Colect Lepid Sialid Coryor Tipul Empi	3 4 3 4 NTHO: t/Not C ), 3= A  pptera ptera ptera loptera loptera lae dalidae didae didae	4 4 4 S Observe	0 0 0 0 0 0 0	Slii Ma Fis 1 = >10   1   1   1   1   1   1   1   1   1	mes croi h  Rar org  2 2 2 2 2 2 2 2 2 2	anis 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 o ms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4 4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochacta Isopoda Amphipoda Decapoda Gastropoda	0 0 0 0 0 0 0 0	DNS ind  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 l 2 l 2 l 2 ROBE: Absentanisms  Anisca Zygor Hemic Colect Lepid Sialid Coryor Tipul Empi Simu	3 4 3 4 NTHO: t/Not Co ), 3= A  optera ptera ptera loptera loptera dalidae didae didae liidae	4 4 4 S Observe	0 0 0 0 0 0 0 0	Slin Ma Fis 1 = >10   1   1   1   1   1   1   1   1   1	Rar org 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	anis 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 o ms) 4 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4 4 4
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda Decapoda	0 0 0 0 0 0 0	DNS ind   1	2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 l 2 l 2 l 2 ROBER Absentanisms  Anisca Zygor Hemi Colect Lepid Sialid Coryor Tipul Empi	3 4 3 4 NTHO: t/Not C ), 3= A  pptera pptera pptera lac dalidae didae didae didae didae	4 4 4 S Observe	0 0 0 0 0 0 0	Slii Ma Fis 1 = >10   1   1   1   1   1   1   1   1   1	mes croi h  Rar org  2 2 2 2 2 2 2 2 2 2	anis 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 o ms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4

## Benthic Macroinvertebrates Collected by BBL Science for Project Number 10213.001.

Sample Location: Sample Date: Sample Type:	Station SC-2 10-Jun-05 Kick Net		
Taxon:	Common Name	Number	Percent
Tubificida			
Tubificidae			
Bothrioneurum vejdovskyanum	tubeworm	3	2.8%
Limnodrilus sp.	tubeworm	i	0.9%
Arhyncobdellida			
Erpobdellidae			
Mooreobdella sp.	leech	1	0.9%
Basommatophora			
Physidae			
Physa sp.	pouch snail	1	0.9%
Planorbidae	-		
poss. Planorhella sp. (tent.)	orb snail	1	0.9%
Ephemeroptera			
Baetidae			
Baetis sp.	mayfly	27	25.5%
Odonata			
Coenagrionidae			
Ischnura sp.	damselfly	1	0.9%
Trichoptera			
Hydropsychidae			
Cheumatopsyche sp.	caddisfly	17	16.0%
Colcoptera			
Elmidae			
Stenelmis crenata gr.	riffle beetle	6	5.7%
Diptera			
Ceratopogonidae			
Atrichopogon sp.	biting midge	1	0.9%
Chironomidae			
Cryptochironomus fulvus gr.	midge	1	0.9%
Thienemannimyia gr.	midge	45	42.5%
Empididae			
Hemerodromia sp.	dance fly	1	0.9%
Total Number of Specimens		106	100.0%
Total Number of Taxa		13	

## FISH SAMPLING FIELD DATA SHEET

									pa	ge		of	
STREAM NAME			SITE NAM	ME.									
STATION#			LOCATIO	N									
RIVER BASIN			UPPER L	IMIT LATIT	UDE/LON	GITUI	DE:						
AGENCY			LOWER	LIMIT LATIT	rude/Lon	GITU	DE:						
GEAR			INVESTIC	GATORS									
FORM COMPLETED	BY		DATE TIME	AM	RE PM	ASON F	OR SUR	VEY					
SAMPLE COLLECTION	How were the Block nets use Sampling Dur Stream width	d? 🗅 YE	ES ON	10	d time		_						
HABITAT TYPES	Indicate the pe	ercentage of % • Pools_	each habita	at type preser		ags	% %	1					
GENERAL COMMENTS													
SPECIES	TOTAL (COUNT)			H (mm)/WEI IAX SUBSAN			r	AÌ	NOM	ALIES	s .		
	(600)	(30011	-		1	D	Е	F	L	М	s	Т	Z
			<del></del> -			R-SEG			HEAT R	1 Section	ार प्रस्तान	- TENEST	F 783
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### FISH SAMPLING FIELD DATA SHEET

SPECIES	TOTAL	OPTIONAL: LENGTH (mm)/WEIGHT (g)			A	NOM	ALIE	s		İ
	(COUNT)	(25 SPECIMEN MAX SUBSAMPLE)	D	E	F	L	М	s	Т	z
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# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME SWO	STREAM NAME SNOW CLERK			LOCATION 5C-5742						
STATION # R	IVERMILE	STREAM CL	ASS							
LATL	ONG	RIVER BASII	٧							
STORET #		AGENCY								
INVESTIGATORS :										
FORM COMPLETED BY	SM C 1597	DATE OG/ TIME 4.5	12/05 D AM (PM	REASON FOR SURVEY						
WEATHER CONDITIONS	Now		Past 24 hours	Has there been a heavy rain in the last 7 days?						
[	storm rain (	(heavy rain) steady rain)	0 %	Air Temperature 85°C						
	showers	(intermittent)		Other						
	70 cle	ar/sunny	<u> </u>	•						
See Il Field Landson MAP	Draw a map of the sh	te and Indicate (	the areas sam	ipled (or attach a photograph)						
STREAM CHARACTERIZATION	Stream Subsystem  Perennial Dinte	rmittent 🗅 Tid	al	Stream Type  Coldwater  Swarmwater						
CAME IV - ARMENIA ROTT	Stream Origin			Catchment Area km²						
	Glacial O Non-glacial montane	Spring-fe  EMixture	ed of origins							

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse    Forest   Commercial   Find/Pasture   Industrial   Agricultural   Other     Residential	Local Watershed NPS Pollution    No evidence   Some potential sources   Dobvious sources   Local Watershed Erosion   None   Moderate   Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant Trees	Grasses Herbaceous
INSTREAM FEATURES	Estimated Reach Lengthm  Estimated Stream Widthm  Sampling Reach Areaioo km²  Area in km² (m²x1000) km²  Estimated Stream Depth 5_ m  Surface Velocity > 0.5_ m/sec (at thalweg)	Canopy Cover   Partly shaded   Shaded   High Water Mark   m   Proportion of Reach Represented by Stream   Morphology Types   Run 90 %   Pool   %   Run 90 %   Channelized   Yes   No   No   Posented   Yes   Pose
LARGE WOODY DEBRIS	LWD	ch area)
AQUATIC VEGETATION	Indicate the dominant type and record the domi   Rooted emergent   Rooted submergent     Floating Algae   Attached Algae     dominant species present     Portion of the reach with aquatic vegetation	Rooted floating
WATER QUALITY	Temperature° C  Specific Conductance  Dissolved Oxygen  pH  Turbidity  WQ Instrument Used	Water Odors    Normal/None
SEDIMENT/ SUBSTRATE	Odors  Normal Sewage Petroleum Chemical Anaerobic None Other  Oild  Absent Slight Moderate Profuse	Deposits Sludge Sawdusi Paper fiber Sand Relict shells Other  Looking at stones which are not deeply embedded, are the undersides black in color? Yes No

INC	RGANIC SUBSTRATE (should add up to		ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)					
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area			
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	.36			
Boulder	> 256 mm (10")	5	]	materials (CPOM)	<b>/</b> )			
Cobble	64-256 mm (2.5"-10")	15	Muck-Mud	black, very fine organic				
Gravel	2-64 mm (0.1"-2.5")	30		(FPOM)				
Sand	0.06-2mm (gritty)	50	Marl	grey, shell fragments				
Silt	0.004-0.06 rrem		]	{				
Clay	< 0.004 mm (slick)		]		•			

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME SNOW CREEK	LOCATION SC - STA 3
STATION#RIVERMILE	STREAM CLASS
LATLONG	RIVER BASIN
STORET#	AGENCY
INVESTIGATORS	
FORM COMPLETED BY  JKS/SML/50-	DATE 06/10/05 TIME 19:50 AM PM  REASON FOR SURVEY

	Habita			Condition	Category	
	Parame		Optimal	Suboptimal	Marginal	Peor
	1. Epifauna Substrate/ Available C		Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
da ea	SCORE	1		(1.10 <u>1.10 1.10 1.10 1.10 1.10 1.10 1.10</u>		
arameters to be evaluated in sampling reach	2. Pool Subs Characteriz		Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
ated	SCORE	8	ing and the street of	10.4 C 4 C 5 V 6 mg	Stephy Stephy	
to be evalu	3. Pool Vari	ability	Even mix of large- shallow, large-deep, small-shallow, small- deep pools present.	Majority of pools large- deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small- shallow or pools absent.
eters	SCORE	4				
Paratte	4. Sediment Deposition	()	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	4				
	5. Channel I Status	Flow	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	17				
	SCORE	17				

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat Parameter		Condition	Category	
rarameter	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
score 17				***
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 4. to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE 6	PORT OF STREET	E CONTRACTOR OF THE		
SCORE  SCORE  S. Bank Stability (score each bank)  SCORE (LB) SCORE (RB)  9. Vegetative Protection (score each bank)  Note: determine	Banks stable; evidence of crosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30- 60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing 60-100% of bank has erosional scars.
SCORE (LB) SCORE (RB)				
left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streamban vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB) SCORE (RB)		7.100		
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE (LB) SCORE (RB)				
otal Score 52+	65 -412	<del></del> ,		

**Snow Creek Station 3** 



#### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	show cress	LOCATION 50	- STA 3								
STATION #	RIVERMILE	STREAM CLASS	STREAM CLASS								
LAT	LONG	RIVER BASIN									
STORET#		AGENCY									
INVESTIGATORS			LOT NUMBER								
FORM COMPLETE	DBY /JK6/47	DATE 6/10/06 TIME AM	REASON FOR SURVEY								
HABITAT TYPES	Indicate the percentage Cobble 6 % Submerged Macrophyte	of each habitat type presen Snags% Uegete es% UO	tated Banks% Sand St	<b>)</b> %							
SAMPLE COLLECTION	Gear used O D-frame How were the samples of Indicate the number of O Cobble / O O Submerged Macrophyte	collected? wading	☐ from bank ☐ from boat								
GENERAL COMMENTS	· Bits of mel- chamaligns · Kicks broke	el in kichs; I difeh a up by 5,5	yout desonatream	; aruns							
	present)		<u> </u>								
Indicate estimated Dominant  Periphyton	LISTING OF AQUATION of abundance: 0 = Abse	ent/Not Observed, 1 = R  2 3 4 Slin	<b>-</b>	0 1 2 3 4							
Indicate estimate Dominant  Periphyton  Filamentous Algae	LISTING OF AQUATION of abundance: 0 = Abse	2 3 4 Slin 2 3 4 Mac	nes croinvertebrates								
Indicate estimated Dominant  Periphyton	LISTING OF AQUATION of abundance: 0 = Abse	ent/Not Observed, 1 = R  2 3 4 Slin	nes croinvertebrates	0 1 2 3 4							
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV	LISTING OF AQUATE d abundance: 0 = Abse	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  SENTHOS ent/Not Observed, 1 = F	nes croinvertebrates	0 1 2 3 4 0 1 2 3 4 0 1 2 3 4							
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV	LISTING OF AQUATE d abundance: 0 = Absorb  O 1  ATIONS OF MACROB d abundance: 0 = Absorb organisi	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  SENTHOS ent/Not Observed, 1 = F	nes croinvertebrates Rare (1-3 organisms), 2 = Com	0 1 2 3 4 0 1 2 3 4 0 1 2 3 4							
Indicate estimated Dominant  Periphyton Filamentous Algaet Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa	LISTING OF AQUATE d abundance: 0 = Absorb  ATIONS OF MACROB d abundance: 0 = Absorb organist  0 1 2 3 4 An 0 1 2 3 4 Zy	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  BENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c	Rare (1-3 organisms), 2 = Comorganisms), 4 = Dominant (>5  2 3 4 Chironomidae 2 3 4 Ephemeroptera	0 1 2 3 4 0 D 2 3 4 0 D 2 3 4 0 D 2 3 4 0 O 0 organisms)							
Indicate estimated Dominant  Periphyton Filamentous Algaet Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa Platyhelminthes	LISTING OF AQUATE d abundance: 0 = Absorb  ATIONS OF MACROB d abundance: 0 = Absorb organist  0 1 2 3 4 An 0 1 2 3 4 Zy	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  SENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c	Rare (1-3 organisms), 2 = Comorganisms), 4 = Dominant (>5	0 1 2 3 4 0 1 2 3 4 0 1 2 3 4 0 1 2 3 4 0 1 2 3 4 0 1 2 3 4 0 1 2 3 4							
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated Porifera Hydrozoa Platyhelminthes Turbellaria	DISTING OF AQUATE d abundance: 0 = Abserved abundance:	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  SENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c)  isoptera goptera o ileoptera o leoptera o leoptera o leoptera o l	Rare (1-3 organisms), 2 = Comorganisms), 4 = Dominant (>5  2 3 4 Chironomidae 2 3 4 Ephemeroptera	0 1 2 3 4 0 0 2 3 4 0 1 2 3 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea	DISTING OF AQUATE d abundance: 0 = Absolute	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  EENTHOS ent/Not Observed, 1 = F ms), 3 = Abundant (>10 c  isoptera goptera miptera 0 1 pidoptera 0 1 pidoptera 0 1	Rare (1-3 organisms), 2 = Comorganisms), 4 = Dominant (>5  2  3  4	0 1 2 3 4 0 1 2 3 4							
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta	DISTING OF AQUATE d abundance: 0 = Absorber	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  BENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c  isoptera goptera o iniptera o ileoptera o ileoptera o ilidae o 1	Chironomidae Ephemeroptera Trichoptera  Other  Care (1-3 organisms), 2 = Com Organisms), 4 = Dominant (>5  Chironomidae Ephemeroptera Trichoptera Other  Carrier Carrier Spp	0 1 2 3 4 0 1 2 3 4							
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda	DISTING OF AQUATE d abundance: 0 = Absorber	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  BENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c  isoptera goptera o ildae o ildae o irydalidae o o o o o o o o o o o o o o o o o o o	Rare (1-3 organisms), 2 = Compressions, 4 = Dominant (>5)  2 3 4 Chironomidae Ephemeroptera Trichoptera 2 3 4 2 3 4 2 3 4 2 3 4	0 1 2 3 4 0 1 2 3 4							
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	DISTING OF AQUATE dabundance: 0 = Absolute dab	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  SENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c  isoptera 0 1 isoptera 0 1 ileoptera 0 1 ipidoptera 0 1 ilidae 0 1 rydalidae 0 1 rydalidae 0 1	Rare (1-3 organisms), 2 = Compressions), 4 = Dominant (>5)  2 3 4 Chironomidae Ephemeroptera Trichoptera 2 3 4 2 3 4 2 3 4 2 3 4 2 3 4	0 1 2 3 4 0 1 2 3 4							
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda Decapoda	DISTING OF AQUATE d abundance: 0 = Absolute	2 3 4 Slim 2 3 4 Mac 2 3 4 Fish  SENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c  isoptera 0 1 pidoptera 0 1	Rare (1-3 organisms), 2 = Compressions, 4 = Dominant (>5)  2  3  4	0 1 2 3 4 0 1 2 3 4							
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda Decapoda Gastropoda	DISTING OF AQUATE d abundance: 0 = Absolute	2 3 4 Slin 2 3 4 Mac 2 3 4 Fish  EENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c  isoptera 0 1 miptera 0 1 pidoptera 0 1 pidoptera 0 1 pidoptera 0 1 pididae 0 1 rydalidae 0 1 mpididae 0 1	Rare (1-3 organisms), 2 = Comorganisms), 4 = Dominant (>5  2  3  4	0 1 2 3 4 0 1 2 3 4							
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda Decapoda	DISTING OF AQUATIONS OF MACROE dabundance: 0 = Absorbed abundance: 0 = Absorbe	2 3 4 Slim 2 3 4 Mac 2 3 4 Fish  SENTHOS ent/Not Observed, 1 = F ms), 3= Abundant (>10 c  isoptera 0 1 pidoptera 0 1	Rare (1-3 organisms), 2 = Compressions, 4 = Dominant (>5)  2  3  4	0 1 2 3 4 0 1 2 3 4							

### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME							SITE NAME													
STATION #		-	_				LOCATION									_				
RIVER BASIN							_		LIMIT		ITI I	DE/I	ON	CITI	IDE.				_	
AGENCY		_	-				_						_		<del></del>					
							LO	LOWER LIMIT LATITUDE/LONGITUDE:  LOT NUMBER									_			
INVESTIGATORS				_			D. 1.						┰				•			_
FORM COMPLETE	D B Y							TE IE		_	АМ	PM		(EA)	SON FOR SURVEY					
HABITAT TYPES	0	Cob	ble	•	%	tage of Sn	ags			οv	egeta		Banl (	cs	%	%				
SAMPLE COLLECTION						ame [			□ w:						k 🚨 from bo				-	
		Coh	hle			r of jab Sn ophytes_	308			ΟV	eget	itat ated ther	Ban	cs						
GENERAL COMMENTS																				
																	_		_	
QUALITATIVE Indicate estimate Dominant					) = 1	Absent	l/Not	Ob	served				e, 2	= C	ommon, 3= Abun					4
Indicate estimate Dominant  Periphyton	d abı				0	Absent 1 2	2 3	<b>Ob</b>	served		Slir	nes				0	1	2	3	
Indicate estimate Dominant	d abı				0 0	Absent	2 3 2 3	4 4	served		Slir Ma	nes			ommon, 3= Abur	0	1		3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate	d abu	ONS	S OI	F M	0 0 0 0 ACI 0 = orga	1 2 1 2 ROBE	2 3 2 3 2 3 NTH t/No: 5), 3=	4 4 4 IOS t Ob	served	d, 1	Slir Ma Fisl	nes croi	nve	tebr	ates rganisms), 2 = Co , 4 = Dominant (>	0 0 0	1 1 1	2 2 2	3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera	ATI(	ONS und	S OI	F M	0 0 0 0 ACI 0 = oorgz	1 2 1 2 1 2 ROBE Absenanisms	2 3 2 3 2 3 NTH t/No.3s), 3=	Ob  4 4 4 4 COS t Ob a	served	d, 1 nt (>	Slir Ma Fisl	mes croi	e (1 anis	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (> Chironomidae	0 0 0 0	1 1 1 1 (3 rgan	2 2 2 2 -9 nism	3 3 s)	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa	ATIO	ONS ind	S OI ance	F M	0 0 0 0 ACI 0 0 0 4 4	1 2 1 2 1 2 ROBE Absenianisms	1/Not 2 3 2 3 NTH t/No s), 3=	Ob  4 4 4 COS t Ob a	served	d, 1 nt (>	Slin Ma Fish 1 1	Rar org	e (1 anis	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera	0 0 0 0	1 1 1 1 m (3 rgan	2 2 2 2 9 nism	3 3 s)	4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes	ATIO	ONS 1 1 1	S OF	77 M 22: 3 3 3	0 0 0 0 ACI 0 = 0 orga	l 2 1 2 1 2 ROBE Absenanisms Anise Zygo Hem	2 3 2 3 NTH t/No s), 3=	Ob  4 4 4 4 IOS t Ob a	served	0 0 0	Slin Ma Fish  1 = 1 1 1	Rarrorg 2	e (1 anis	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 mm (3 rgan	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria	ATIO	ONS and 1 1 1 1	S OI ance	F M 3 3 3 3 3	0 0 0 0 ACI 0 = orga 4 4 4 4	l 2 l 2 l 2 ROBE Absenanisms Zygo Hem Coled	2 3 2 3 NTH t/No s), 3=	Ob  4 4 4 COS t Ob a a a a	served	d, 1 0 0 0	Slin Ma Fist	Rar org	e (1 anis	-3 or ms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera	0 0 0 0	1 1 1 1 m (3 rgan	2 2 2 2 9 nism	3 3 s)	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea	ATIO	DNS ind  1 1 1 1 1	2 2 2 2 2	3 3 3 3 3	0 0 0 0 ACI 0 = ACI 4 4 4 4 4 4 4	1 2 1 2 1 2 ROBE Absentanisms Anise Zygo Hem Coler Lepid	NTH t/No opter opter opter opter dopter dopte	Ob  4 4 4 COS t Ob a a a a	served	0 0 0 0 0	Slin Ma Fish 1 1 1 1 1 1	Rar org	3 3 3 3 3	-3 or ms)	rganisms), 2 = Co, 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 mm (3 rgan	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta	0 0 0 0 0	DNS 1 1 1 1 1 1 1 1	2 2 2 2 2 2	3 3 3 3 3 3	0 0 0 0 ACI 0 0 = ACI 0 0 = Orga 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	l 2 l 2 l 2 ROBE Absentanisms Anise Zygo Hem Colect	2 3 2 3 NTH tt/No s), 3= opter optera iptera opter dopte dae	Ob  4 4 4 4 IOS t Oh a a a a ara	served	d, 1 0 0 0 0 0 0 0 0	Slim Ma Fish  1 1 1 1 1 1 1 1	Rarrorg  2 2 2 2 2 2 2	3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4	rganisms), 2 = Co, 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 mm (3 rgan	2 2 2 2 nism	3 3 3 3 3	4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda	0 0 0 0 0 0	DNS ind 1 1 1 1 1 1 1	2 2 2 2 2 2 2	3 3 3 3 3 3	0 0 0 0 ACI 0 = ACI 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 l 2 l 2 ROBE Absentanisms  Anise Zygo Hem Cole: Lepid Sialid Cory	Not 2 3 2 3 NTH t/No s), 3= opter optera opter dopter dopted dae	Ob  4 4 4 4 IOS t Oh a a a a a a a	serve	d, 1 0 0 0 0 0	Slin Ma Fiss  1 1 1 1 1 1 1	Rar org 2 2 2 2 2 2 2	3 3 3 3 3 3 3	-3 or ms)	rganisms), 2 = Co, 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 mm (3 rgan	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	0 0 0 0 0 0	DNS 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 ACI 0 = A 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	l 2 1 2 1 2 ROBE Absenanisms Anisa Zygo Hem Colea Lepia Sialia Cory Tipu	Not 2 3 2 3 NTH t/No opter optera iptera opter dopted dalid lidae	Ob  4 4 4 COS t Ob a a a a a a a a a	serve	d, 1 (> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Slin Ma Fish  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Rarrorg  2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4 4	rganisms), 2 = Co, 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 mm (3 rgan	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda Decapoda	0 0 0 0 0 0 0	DNS 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 1 2 1 2 ROBE Absenanisms  Aniss Zygo Hem Colect Lepid Sialid Cory Tipu Empi	Not 2 3 2 3 NTH t/No s), 3= optera optera doptera	Ob  4 4 4 4 COS a a a a a a a a a a a	serve	d, 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Slin Ma Fist 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Rar org	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4 4 4	rganisms), 2 = Co, 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 mm (3 rgan	2 2 2 2 nism	3 3 3 3 3	4 4 4 4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	0 0 0 0 0 0	DNS 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0 0 0 0 ACI 0 = A 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	l 2 1 2 1 2 ROBE Absenanisms Anisa Zygo Hem Colea Lepia Sialia Cory Tipu	2 3 2 3 NTH t/No s), 3= opter adopter dapted dae dalidae ididae ididae ididae ididae ididae opter da shiidae ididae ididae opter da shiidae ididae opter da shiidae opter da shi	4 4 4 IOS a a a a a a a a a a a a a a a a a a a	serve	d, 1 (> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Slin Ma Fish  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Rarrorg  2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 or ms) 4 4 4 4 4 4 4	rganisms), 2 = Co, 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 0 0 0 0 0	1 1 1 mm (3 rgan	2 2 2 2 nism	3 3 3 3 3	4 4 4 4

## Benthic Macroinvertebrates Collected by BBL Science for Project Number 10213.001.

Sample Location: Sample Date: Sample Type:	Station SC-3 10-Jun-05 Kick Net		:
Taxon:	Common Name	Number	Percent
Lumbricina			
Lumbricidae			
Eiseniella tetraeidra	earthworm	1	6.3%
Basommatophora			
Physidac			
Physa sp.	pouch snail	1	6.3%
Ephemeroptera			
Baetidae			
Baetis sp.	mayfly	3	18.8%
Diptera			
Chironomidae			
Orthocladius sp.	midge	4	25.0%
Thienemannimyia gr.	midge	7	43.8%
Total Number of Specimens Total Number of Taxa		16 5	100.0%

## FISH SAMPLING FIELD DATA SHEET

									pa	ge_		of	
STREAM NAME			SITE NA	ME									
STATION#			LOCATIO	ON									
RIVER BASIN			UPPER L	IMIT LATITUD	DE/LON	GITUI	DE:						
AGENCY			LOWER	LIMIT LATITUI	DE/LON	IGITU	DE:						
GEAR			INVESTI	INVESTIGATORS									
FORM COMPLETED	ВҮ	DATE TIME	AM F	3	ASON F	OR SUR	VEY						
SAMPLE COLLECTION	How were the fish captured?						-					-	
HABITAT TYPES	Indicate the po Riffles Submerged N	% 🗖 Pools	%	□ Runs %	6 □ Sna	ags	%	·					
GENERAL COMMENTS													
SPECIES	TOTAL	OPTIONA	J.: LENGT	H (mm)/WEIGH	HT (p)	T		Ai	NOM	ALIES	*		
<b>5. 5.</b>	(COUNT)			1AX SUBSAMP		D	E	F		М	s	Т	z
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## FISH SAMPLING FIELD DATA SHEET

SPECIES	SPECIES TOTAL OPTIONAL: LENGTH (mm)/WEIGHT			ANOMALIES*								
	(COUNT)	(25 SPECIMEN MAX SUBSAMPLE)	D	E	F	L	М	s	T	Z		
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## PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

CTREAM NAME CO	TREAM NAME SAMUL CRIMI		LOCATION SC-STA3						
	JVERMILE	STREAM CLA		51743					
	ONG	RIVER BASIN		<del></del>					
STORET #	JNG	AGENCY	<u> </u>						
DHIDOMIC : MODO		AGENC I							
FORM COMPLETED BY	,	DATE 15:	30	REASON FOR SURVEY					
JKS/SML	ISPT	TIME 26/1	ZOJ AM PM	) REASON FOR SORVE!					
L		<del></del>		<del></del>					
WEATHER CONDITIONS	Now '		Past 24	Hay there been a heavy rain in the last 7 days?					
		(heavy rain)		Air Temperature SS"C					
	showers	steady rain) (intermittent)	0	Other					
	// 20 %0€ %ci	oud cover ar/sunny	<u></u> %	Other					
CONTRACTOR OF A TION OF A D		<del></del>		tel ( ) and by a better and by					
SITE LOCATION/MAP	Draw a map of the so	le and indicate t	be areas san	npled (or attach a photograph)					
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STREAM CHARACTERIZATION	Stream Subsystem W Perennial Inte	rmittent 🖸 Tide	al	Stream Type Coldwater Warmwater					
	Stream Origin	O Spring-fe	d of origins	Catchment Areakm²					

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES  RIPARIAN VEGETATION (18 meter buffer)	Predominant Surrounding Landuse  Forest  Field/Pasture  Industrial  Indicate the dominant type and record the dominant species present	Local Watershed MS Pollution  No evidence Some potential sources  Obvious sources  Local Watershed Erosion  None Moderate Heavy  nant species present Grasses Herbaceous
INSTREAM FEATURES	Estimated Reach Lengthm  Estimated Stream Widthm  Sampling Reach Area	Conopy Cover Partly open Partly shaded Shaded  High Water Mark 3 m for the Proportion of Reach Represented by Stream Morphology Types Briffle 5 % Pron 5 % Pool 8  Channelized Pres No
LARGE WOODY DEBRIS	LWDm² MA	ch area)
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present    Rooted emergent	☐ Rooted floating ☐ Free floating
WATER QUALITY  SHEW HAR	Temperature° C  Specific Conductance  Dissolved Oxygen  pH  Turbidity  WQ Instrument Used	Water Odors ONOrmal/None
SEDIMENT/ SUBSTRATE	Oxfors Oxfors Oxformal Chemical Anaerobic None Other Oils Oxformal Absent Slight Moderate Oxformal Petroleum None	Deposits Sludge Sawkus Paper fiber Sand Cher  Looking at stones which are not deeply embedded, are the undersides black in color? Yes No

INC	RGANIC SUBSTRATE (should add up to		ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)				
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area		
Bedrock			Detritus	sticks, wood, coarse plant			
Boulder	> 256 mm (10°)	490	]	materials (CPOM)	75		
Cobble	64-256 mm (2.5"-10")	20	Muck-Mud	black, very fine organic			
Gravel	2-64 mm (0.1"-2.5")	10	1	(FPOM)			
Sand	0.06-2mm (gritty)	30	Marl	grey, shell fragments			
Silt	0.004-0.06 mm		]	{			
Clay	< 0.004 mm (slick)		]				

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME SNOW CREEK	LOCATION SC-STA 3
STATION # RIVERMILE	STREAM CLASS
LATLONG	RIVER BASIN
STORET#	AGENCY
INVESTIGATORS	
FORM COMPLETED BY  JESSML SPT	DATE 15:70 REASON FOR SURVEY

	Habitat Parameter		Condition	Category	
	FARAIRETER	Optimal	Suboptimal	Marginal	Poor
	Epifaunal     Substrate/     Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
reach	SCORE +		1000	Transfer to the second	
Parameters to be evaluated in sampling reach	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay, mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
ated	SCORE +				
υ be evalu	3. Pool Variability	Even mix of large- shallow, large-deep, small-shallow, small- deep pools present.	Majority of pools large- deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small- shallow or pools absent.
ters 1	SCORE &				
Parame	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE \ T				
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE LY				

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## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

Habitat		Condition	Category			
Parameter	Optimal	Suboptimal	Marginal	Poor		
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reac channelized and disrupted. Instream habitat greatly aftered or removed entirely.		
SCORE 8		A CANADA				
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length I to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.		
score 3		tropy of the Control And the				
SCORE 3  8. Bank Stability (score each bank)  SCORE 10 (LB) SCORE 2 (RB)  9. Vegetative Protection (score each bank)  Note: determine	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30- 60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing 60-100% of bank has erosional scars.		
SCORE (LB)				K S. ROBERTON		
9. Vegetative Protection (score each bank) Note: determine left or right side b facing downstream	covered by native vegetation, including trees, understory shrubs, or nonwoody	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambar vegetation is very high vegetation has been removed to 5 centimeters or less in average stubble height.		
SCORE $\frac{10}{2}$ (LB)						
10. Riparian Vegetative Zone Width (score each bank riparian zon	lots, roadbeds, clear-cuts,	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.		
SCORE (LB)	The state of the s					

Total Score <u>lob + 59</u> = 124

A-10

**Snow Creek Station 4** 



#### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	SNOW CE	m	LOCATION	50	STA 4			<del></del>			
STATION #	RIVERMII		<del></del>	STREAM CLASS							
LAT	LONG		RIVER BASIN				<del></del>				
STORET#			AGENCY								
INVESTIGATORS			1		LOT NUMB	FR					
FORM COMPLETED	RY		DATE G/10	105	REASON FO						
	/JKS/50	7	TIME	AM PM							
HABITAT TYPES	Cobble		f each habitat typ	e present O Vegetated I	Banks%	1 Sand 1	<u>///</u> %				
SAMPLE	Gear used	☐ D-frame	kick-net	O Other							
COLLECTION	How were t	he samples co	llected?	ading 🔾	from bank	🗅 from boa	at				
	Cobble_/	number of ja  O Si d Macrophytes	bs/kicks taken in nags	each habitat t O Vegetated I Other (	ype. 3anks	Sand /	<u>o</u>				
GENERAL COMMENTS	. 20	Foot	box cul	vert.	law Flo						
QUALITATIVE I Indicate estimated Dominant  Periphyton		0 = Absen		I, 1 = Rare,	, 2 = Commo	n, 3= Abun	dant, 4 =	3 4			
Filamentous Algae		(2) I	2 3 4	Macroin	vertebrates		$0 \bigcirc 2$	3 4			
Macrophytes		0 1	2 3 4	Fish			0 1 (2)	3 4			
FIELD OBSERVA Indicate estimated		0 = Abser						s)			
Porifera	0 1 2		optera		l l	nomidae	$0 \Omega^2$	3 4			
Hydrozoa Platubalminthas	0 1 2		optera			neroptera	$\begin{pmatrix} 1 \\ 1 \end{pmatrix}^2$	3 4			
Platyhelminthes Turbellaria			iptera	0 1 2		optera	0(1)2	3 4			
Hirudinea			optera doptera	$0 \bigcirc 2$ 0 1 2 $\cdot$	3 4 Other 3 4		0 1 2	3 4			
Oligochaeta		3 4 Siali	•	0 1 2	3 4						
Isopoda		1	dalidae	0 1 2	3 4						
Amphipoda			lidae	0 1 2	3 4						
Milipinipoda	U 1 2 .			0 1 2	, <del>,</del> ,						
Decapoda			ididae	0 1 2	3 4						
- •	0 1 2	3 4 Emp			· •						
Decapoda	$0 \frac{1}{2} \frac{2}{2}$	3 4 Emp	ididac ıliidae nidae		3 4						

### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	SITE NA			NAM	Œ													
STATION#			_				ATIO								_			
RIVER BASIN								MIT LAT	ותו	IDE/	LON	CIT	IDE:					
AGENCY																		
INVESTIGATORS	LOWER LIMIT LATITUDE/LONGITUDE						NUMBER		_			_						
FORM COMPLETED	) BY					DAT TIM	E _		АМ	PM	†;		SON FOR SURVEY					
HABITAT TYPES	i □ Co	bble	•	%		ags .		t type pi	eget		Ban (	ks	% □ Sand%	%			•	
SAMPLE COLLECTION	How India	were ate tl	the :	samp imbe	iles colli r of jab	ected? s/kick	s take	□ wadin n in eacl □ \	g h hal /cgei	⊂ bitat	froi type Ban	n bar	k	at				
GENERAL COMMENTS											- <del></del>							
QUALITATIVE Indicate estimated								rved,	] = ]	Rar	e, 2	= C	ommon, 3= Abun	dant,	4 =			-
Indicate estimated Dominant				0 = 1	Absent	/Not	Obse	rved,				= C	ommon, 3= Abun					
Indicate estimated Dominant  Periphyton	i abun			0 = 0	bsent 1 2	/Not	Obse 4	rved,	Sli	mes		_	·	0	1	2	-	
Indicate estimated Dominant	d abund			$0 = \lambda$ $0$ $0$	Absent	/Not	<b>Obse</b> 4  4	rved,	Sli	mes icroi	nve	= C	ates	0		2 2	3 3 3	
Periphyton Filamentous Algae Macrophytes  FIELD OBSERV. Indicate estimated	ATION	S O	e: (	0 0 0 0 ACI 0 = orga	1 2 1 2 1 2 ROBE	/Not  3 3 3 NTH- t/Not ), 3=	4 4 4 OS Obse	erved,	Slii Ma Fis	mes icroi h	nve	rtebr	rganisms), 2 = Co , 4 = Dominant (>	0 0 0	1 1 1	2 2 2	3	4
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Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated	ATION d abund	S Odanc	F M e:	0 0 0 0 ACI 0 = org2	1 2 1 2 1 2 ROBE	/Not  3 3 3 NTHet/Not ), 3=  optera ptera	Obse 4 4 4 OS Obse Abur	erved, ndant (: 0	Slii Ma Fis 1 = >10	mes acroi h Rar org	nve e (1 anis	-3 or sms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera	0 0 0 0 mmoi 50 oi	l l l m (3	2 2 2 2 9 nism	3 3 3 3	4 4
Periphyton Filamentous Algae Macrophytes  FIELD OBSERV. Indicate estimated  Porifera Hydrozoa Platyhelminthes	ATION d abund	SS Odanc	F M e:	0 0 0 0 ACI 0 = org:	1 2 1 2 1 2 ROBE Absentanisms Aniso Zygo Hemi	3 3 3 NTH tt/Not pptera	4 4 4 OS Obse	erved, ndant (	Sli Ma Fis 1 = >10	Rar org	nve (I anis	-3 or sms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 50 or	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2	3 3 3 3 3	4 4 4 4
Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria	ATION d abund 0 1 0 1 0 1 0 1	S O danc	F M e:	0 0 0 0 ACI 0 = org2 4 4 4 4	1 2 1 2 1 2 1 2 Absentanisms  Aniso Zygo Hemi Coleo	3 3 3 NTH t/Not t/Not ptera ptera	Obse  4 4 4 OS Obse Abur	orved, ndant (	Slii Ma Fis 1 = >10	mes acroi h Rar org	3 3 3 3	-3 or sms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera	0 0 0 0 mmoi 50 oi	1 1 1 m (3 rgan	2 2 2 2 9 nism	3 3 3 3	4 4 4 4
Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea	ATION d abund 0 1 0 1 0 1 0 1 0 1	S O dance	F M e:	0 0 0 0 ACI 0 = ACI 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 2 1 2 1 2 ROBERADSEMS Anison Zygoo Hemi	3 3 3 NTHit/Not t/Not t/Not pptera pptera iptera doptera	Obse  4 4 4 OS Obse Abur	0 0 0 0 0	Slii Ma Fis 1 = >10	Rar org	nve  (1 anis  3 3 3 3 3 3	-3 or sms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 50 or	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2	3 3 3 3 3	4 4 4
Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta	0 1 0 1 0 1 0 1 0 1 0 1	S O dance	F M e:	0 0 0 0 0 ACI 0 = org2	1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	3 3 3 NTHit/Not hypotera pptera pptera doptera doptera dae	Obse  4 4 4 OS ObseAbur	0 0 0 0 0	Slii Ma Fis 1 = >10	Ran org	3 3 3 3 3 3 3 3	-3 of sms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 50 or	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2	3 3 3 3 3	4 4 4
Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda	0 1 0 1 0 1 0 1 0 1 0 1 0 1	SS Odance	F M e:	0 0 0 0 0 ACI 0 = org2	1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	3 3 3 NTHet/Not t/Not	Obse  4 4 4 OS ObseAbur	0 0 0 0 0 0	Sli Ma Fis  1 = >10  1	Rar org	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 of sms)	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmoi 50 or	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2	3 3 3 3 3	4 4 4
Periphyton Filamentous Algae Macrophytes  FIELD OBSERV. Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	ATION d abund 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	F M e:	0 0 0 0 0 ACI 0 0 0 4 4 4 4 4 4 4 4 4	1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	3 3 3 NTH- t/Not t	Obse  4 4 4 OS Obse Abur	0 0 0 0 0 0	Slii Ma Fis 1 = >10	mes secroich Part org	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 or sms) 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmoi 50 or	1 1 1 m (3 rgan	2 2 2 2 2 2 2 2	3 3 3 3 3	4 4 4
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Periphyton Filamentous Algae Macrophytes  FIELD OBSERV. Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	ATION d abund 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	F M e:	0 0 0 0 0 ACI 0 0 0 4 4 4 4 4 4 4 4 4	1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2	3 3 3 NTHit/Not t/Not t/	Obse 4 4 4 OS Obse Abur	0 0 0 0 0 0	Slii Ma Fis 1 = >10	mes secroich Part org	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 or sms) 4 4 4 4 4 4 4	rganisms), 2 = Co , 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0 mmoi 50 or	1 1 1 m (3 rgan	2 2 2 2 2 2 2 2	3 3 3 3 3	4

## Benthic Macroinvertebrates Collected by BBL Science for Project Number 10213.001.

Sample Location: Sample Date:	Station SC-4 10-Jun-05 Kick Net		
Sample Type: Taxon:	Common Name	Number	Percent
Basommatophora		i	
Physidae		1	
Physa sp.	pouch snail	1	3.6%
Ephemeroptera		Į	
Baetidae			
Baetis sp.	mayfly	3	10.7%
Trichoptera		I	
Hydropsychidae		ļ	
Cheumatopsyche sp.	caddisfly	1	3.6%
Diptera			0.0%
Chironomidae		ł	
Ablabesmyia mallochi	midge	1	3.6%
Orthocladius nigritus	midge	1	3.6%
Orthocladius sp.	midge	4	14.3%
Thienemannimyia gr.	midge	17	60.7%
Total Number of Specimens Total Number of Taxa		28 7	100.0%

## FISH SAMPLING FIELD DATA SHEET

									pa	ge_		of	
STREAM NAME			SITE NAM	E									
STATION#			LOCATIO	N									
RIVER BASIN			UPPER LIMIT LATITUDE/LONGITUDE:										
AGENCY			LOWER LIMIT LATITUDE/LONGITUDE:										
GEAR			INVESTIG	ATORS									
FORM COMPLETED	DATE TIME	AM PM		ASON F	OR SUR	VEY							
SAMPLE COLLECTION	Block nets use	d? □ YE	time	ack	e								_
HABITAT TYPES	Indicate the pe	% D Pools	% 1		□ Sna	ngs	_%						
GENERAL COMMENTS				-								_	
SPECIES	TOTAL			(mm)/WEIGHT				Al	NOM	ALIE:	s <sup>*</sup>		
	(COUNT)	(25 5 F E	CIMEN MA	X SUBSAMPLI	L)	D	E	F	L_	М	s	Т	Z
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## FISH SAMPLING FIELD DATA SHEET

SPECIES	TOTAL (COUNT)	OPTIONAL: LENGTH (mm)/WEIGHT (g) (25 SPECIMEN MAX SUBSAMPLE)	ANOMALIES								
	(COUNT)	(25 SPECIMEN MAX SUBSAMPLE)	D	E	F	L	М	s	Т	z	
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# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME 520	w creek	LOCATION	SC-	5TA 4				
STATION #R	IVERMILE	STREAM CLASS						
LATL	ONG	RIVER BASIN						
STORET #		AGENCY						
INVESTIGATORS .								
FORM COMPLETED BY  JUS /SPH 51		DATE OCAL TIME 16 07	AM (P)	REASON FOR SURVEY				
Site Location/Map  Site Location/Map  Little	rain ( showers %cl cle  Draw a map of the sit	(heavy rain) steady rain) (intermittent) oud cover iar/sumny te and indicate to	Past 24 hours  O  O  Mean areas sar	Has there been a heavy rain in the last 7 days?  Ores ONO  Air Temperature COther  Inpled (or attach a photograph)				
STREAM CHARACTERIZATION		rmittent 🚨 Tida	al	Stream Type Coldwater  Cotchwart Asso				
	Stream Origin Glacial Non-glacial montant	Spring-fe Un Mixture of Other	d of origins	Catchment Areakm²				

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse    Forest   Commercial     Field/Pasture   Industrial     Agricultural   Other     Residential	Local Watershed NPS Pollution  No evidence Some potential sources  Dobvious sources  Local Watershed Erosion  None Moderate Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dom Trees  dominant species present  Sycamore, a	Inant species present Grasses Herbaceous
INSTREAM FEATURES	Estimated Reach Lengthm  Estimated Stream Widthm  Sampling Reach Aream²  Area in km² (m²x1000)km²  Estimated Stream Depthm  Surface Velocity 0, 5 - 1, 2 m/sec (at thalweg)	Canopy Cover Partly shaded  High Water Mark  Proportion of Reach Represented by Stream Morphology Types  Riffle 50 % Run 50%  Channelized O Yes O No  Dam Present O Yes O No
LARGE WOODY DEBRIS	LWDm²m²/km² (LWD/ rea	ch area)
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present    Rooted emergent   Rooted submergent   Attached Algae     Rooted submergent   Attached Algae     Rooted submergent   Rooted submergent   Rooted submergent     Rooted submergent   Rooted submergent   Rooted submergent     Rooted submergent   Rooted submerg	☐ Rooted floating ☐ Free floating
WATER QUALITY  See Old	Temperature° C  Specific Conductance  Dissolved Oxygen  pH  Turbidity  WQ Instrument Used	Water Odors  Normal/None Sewage Petroleum Chemical Fishy Other  Water Surface Oils Slick Sheen Other Turbidity (if not measured) Clear Slightly turbid Opaque Stained Other
SEDIMENT/ SUBSTRATE	Other  Chemical Sewage Petroleum Chemical Anaerobic None Other  Oths Absent Slight Moderate Profuse	Deposits Sludge Sawdust Paper fiber Sand Relict she is Other Looking at stones which are not deeply embedded, are the undersides black in color? Yes No

INC	RGANIC SUBSTRATE (should add up to		ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)					
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area			
Bedrock			Detritus	sticks, wood, coarse plant				
Boulder	> 256 mm (10")	3	1	materials (CPOM)	1 -0 -			
Cobble	64-256 mm (2.5"-10")	35	Muck-Mud	black, very fine organic				
Gravel	2-64 mm (0.1°-2.5°)	20	1	(FPOM)	-01			
Sand	0.06-2mm (gritty)	40	Mari	grey, shell fragments				
Silt	0.004-0.06 mm				- 0 -			
Clay	< 0.004 mm (slick)		1					

A-6

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME STOW CREEK	LOCATION SC-STA 4
STATION#RIVERMILE	STREAM CLASS
LATLONG	RIVER BASIN
STORET #	AGENCY
INVESTIGATORS	
FORM COMPLETED BY  JUS/SML/SPT	DATE OCA 12/05 TIME 1600 AM PM REASON FOR SURVEY

	Habitat	Condition Category										
	Parameter	Optimal	Suboptimal	Marginal	Poor							
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.							
re Ch	SCORE 2											
Parameters to be evaluated in sampling reach	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.							
ated	SCORE Q	20 1 2 2 3		562 PV 19 19								
o be evalu	3. Pool Variability	Even mix of large- shallow, large-deep, small-shallow, small- deep pools present.	Majority of pools large- deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small- shallow or pools absent.							
ters	SCORE											
Param	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.							
	SCORE 4											
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or niffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.							
	SCORE 7											

## HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

	Habitat	Condition Category									
	Parameter	Optimal	Suboptimal	Marginal	Poor						
	6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.						
	SCORE 8				Silver shirts						
oling reach	7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.						
samp	SCORE 4										
Parameters to be evaluated broader than sampling reach	8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30- 60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.						
be evalua	$\frac{\text{SCORE} \underline{10}_{(LB)}}{\text{SCORE} \underline{10}_{(RB)}}$			14 14 78 1VE							
Parameters to	9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.						
	SCORE $\frac{9}{2}$ (LB)										
	SCORE (RB)										
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.						
	SCORE (LB) SCORE (RB)	8 = 120			10 70 mg						

Total Score 62+68 = 130

**Snow Creek Station 5** 



## BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	Sum c	List	LO	CATION	50	- 5	77)	~					
STATION #	STI	STREAM CLASS											
LAT	LONG	RJV	RIVER BASIN										
STORET#			AG	ENCY									
INVESTIGATORS				<del></del>			I OT	NUMBER					
FORM COMPLETED	I DA	TE 6/1	1/18			SON FOR SURVEY							
5M	1/2-16/2	P	TIN			PM	REA						
HABITAT TYPES	Indicate t Cobble Submer	340 %	otage of each  Snags_ ophytes		Veget	tated B	anks_	_% © Sand_	<b>8</b> 3/5				
SAMPLE COLLECTION	Gear used	D-fi	rame Okic	k-net		Other_			_				
	How were	the sam	ples collected	1? <b>E</b> wi	ading	□ fi	rom ba	nk 📮 from be	pat				
	Indicate t	he aumhe	er of jabs/kic	ks taken in i	each hal	hitat tv	ne		^				
1	Cobble_	8	C Snags_	3	U Veget	ated B		2_	<u>7</u> .				
	C) Submer	ged Macro	ophytes			Other (		<u>2 ) a</u>	MIRITUS A	core			
GENERAL	. 11m	Ktav	E Rock	OUTG	ROPF	MI		2 44	AL ISLIM	s on			
COMMENTS	li .	_						201	06 E				
QUALITATIVE I Indicate estimated Dominant					i, i = i	Rare,	2 = 0	Common, 3= Abui	ndant, 4=				
Indicate estimated Dominant			Absent/Not	Observed		·	2 = 0	Common, 3= Abui	<del></del>	<del>0∕3</del> ₄			
Indicate estimated Dominant Periphyton	d abundanc		Absent/Not	Observed	Slir	mes			0 1 <u>2</u>	<b>≫</b> /3 4			
Indicate estimated Dominant  Periphyton Filamentous Algae	d abundanc		Absent/Not	Observed	Slir	mes			<del></del>	<b>3</b> 4 <b>3</b> 4 <b>3</b> 4 <b>3</b> 4			
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Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA	d abundanc	e: 0 = 0 0 0 0 F MACI e: 0 =	Absent/Not  1 2 3 1 2 3 1 2 3 ROBENTH	4 4 4 4 IOS t Observed	Slin Ma Fis	mes croinv h Rare (	/erteb	rganisms), 2 = Co	0 1 <u>2</u> 0 <u>1</u> 2 0 1 2	<u> 3</u> 4			
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated	d abundanc	e: 0 = 0 0 0 0 F MAC! e: 0 =	Absent/Not  1 2 3 1 2 3 1 2 3 1 2 3 ROBENTH Absent/No anisms), 3=	4 4 4 4 IOS t Observed	Slin Ma Fis d, 1 =	mes croinv h Rare ( organ	/erteb (1-3 o bisms)	rganisms), 2 = Co , 4 = Dominant (2 Chironomidae	0 1 2 0 1 2 0 1 2	ms)			
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Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa	ATIONS Of abundance	e: 0 =  0 0 0 0  F MACI e: 0 = 0 = 3 4 3 4	Absent/Not  1 2 3 1 2 3 1 2 3 1 2 3 ROBENTH Absent/No anisms), 3=  Anisopter Zygoptera Hemiptera Coleopter	4 4 4 IOS t Observed	Slin Ma Fis  d, 1 = 0 (>10	Rare organ	(1-3 o o o isms)	rganisms), 2 = Co , 4 = Dominant (2 Chironomidae Ephemeroptera	0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 2 2	ms)  3 4 3 4 3 4			
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes	ATIONS OI abundance  0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2	6: 0 =  6	Absent/Not  1 2 3 1 2 3 1 2 3 1 2 3 ROBENTH Absent/No anisms), 3=  Anisopter Zygoptera Hemipter Coleopter Lepidopte	4 4 4 IOS t Observed	Slin Ma Fis  d, 1 = nt (>10  0 1 0 1 0 1	Rare organ	(1-3 o o isms) 3 4 3 4 3 4	rganisms), 2 = Co , 4 = Dominant (2 Chironomidae Ephemeroptera Trichoptera	0 1 2 0 1) 2 0 1 2 0 1 2 0 1 2 0 2 0 1 2	ms)  3 4 3 4 3 4			
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Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2	0 0 0 0 0 F MACI e: 0 = org: 3 4 3 4 3 4 3 4 3 4 3 4 3 4	Absent/Not  1 2 3 1 2 3 1 2 3 1 2 3 ROBENTH Absent/No anisms), 3=  Anisopter Zygoptera Hemipter Coleopter Lepidopte Sialidae Corydalid Tipulidae	4 4 4 IOS t Observed a a a a a a	Slin Ma Fis  d, 1 = nt (>10  0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	Rare organ	(1-3 o (1	rganisms), 2 = Co , 4 = Dominant (2 Chironomidae Ephemeroptera Trichoptera	0 1 2 0 1) 2 0 1 2 0 1 2 0 1 2 0 2 0 1 2	ms)  3 4 3 4 3 4			
Indicate estimated Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERVA Indicate estimated  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda Decapoda	0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2 0 1 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Absent/Not  1 2 3 1 2 3 1 2 3 1 2 3 ROBENTH Absent/No anisms), 3=  Anisopter Zygoptera Hemiptera Coleopter Lepidopte Sialidae Corydalid Tipulidae Empididae	4 4 4 4 IOS t Observed Abundan a a a a e e e	Slin Ma Fis  d, 1 = nt (>10  0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	Rare 6 organ  2 3 3 2 3 3 2 3 3 2 3 3 2 3 3	(1-3 o o o o o o o o o o o o o o o o o o o	rganisms), 2 = Co , 4 = Dominant (2 Chironomidae Ephemeroptera Trichoptera	0 1 2 0 1) 2 0 1 2 0 1 2 0 1 2 0 2 0 1 2	ms)  3 4 3 4 3 4			

#### BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

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STREAM NAME			SITE NAME																
STATION#						LOCATION													
RIVER BASIN							UPPER LIMIT LATITUDE/LONGITUDE:												
AGENCY							LOW	ER L	IMIT LA	TIT	UDE	/LO	NGI:	TUDE:					
INVESTIGATORS			_					•				T	LOT	NUMBER					_
FORM COMPLETED BY						DAT TIM	E _		ΑМ	РМ		REAS	SON FOR SURVEY						
HABITAT TYPES Indicate the percentage of Cobble% Sn							28	nabita %	ūν	eget	ated	Bani	ks	% □ Sand%	%				
SAMPLE COLLECTION	Gear used D-frame					oles colle	cted?		🗅 wadin	□ C	ther	fror	n bar						
Indicate the number of jal □ Cobble □ Solumerged Macrophytes					□ Snag	ζS		ΟV	eget	ated	Banl	ks	Sand )	_					
GENERAL COMMENTS																			
																			_
<b>Dominant</b> Periphyton	d abı				0 = A	Absent/I	Not 3	Obse 4	rved, 1	Slir	nes			ommon, 3= Abun	0	1	2	3	
Indicate estimate Dominant	d abı	und			0 = A $0$ $0$	Absent/I	3 3	Obse  4 4	rved, 1	Slii Ma	nes	nve		ommon, 3= Abun	0	1 1	2 2	3 3 3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV	d abi	ONS	s OI	e: (	0 0 0 0 0 ACI	1 2 1 2 1 2 ROBEN	3 3 3 THe	Obse  4 4 4 4 OS Obse	erved,	Slin Ma Fisi	nes croi h_	nve	rtebr		0 0 0	1 1 1	2 2 2	3 3	4
Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera	e ATIO	ONS	S OI ance	F M 3	0 0 0 0 ACI 0 = orga	1 2 1 2 1 2 ROBEN Absent/anisms)	3 3 3 3 TH0 Not, 3=	Obse  4 4 4 OS Obse Abui	erved, adant (2	Slii Ma Fis	mes croi h Rar org	nver	-3 or sms)	rganisms), 2 = Col , 4 = Dominant (>	0 0 0 0	1 1 1 m (3 rgan	2 2 2 2	3 3	4
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Indicate estimate Dominant  Periphyton Filamentous Algae Macrophytes  FIELD OBSERV Indicate estimate  Porifera Hydrozoa Platyhelminthes Turbellaria Hirudinea Oligochaeta Isopoda Amphipoda	0 0 0 0 0 0	ONS und	2 2 2 2 2 2 2 2 2	F M e: 3 3 3 3 3 3 3 3 3 3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	l 2 l 2 l 2 l 2 l 2 l 2 l 2 l 2 l 2 l 2	3 3 3 THe Not ratera optera op	Obse  4 4 4 OS Obse Abui	0 0 0 0 0 0	Slii Ma Fis 1 = >10   1   1   1   1   1   1   1   1   1	Rarrorg  2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	-3 or sms) 4 4 4 4 4 4 4	rganisms), 2 = Coo, 4 = Dominant (>  Chironomidae Ephemeroptera Trichoptera	0 0 0 0	1 1 1 m (3 rgat	2 2 2 2 nism 2 2 2	3 3 3 3 3	4 4 4 4

## Benthic Macroinvertebrates Collected by BBL Science for Project Number 10213.001.

Sample Location: Sample Date:	Station SC-5 10-Jun-05				
Sample Type:	Kick Net			ł	
37		SC	-5A	sc	-5B
Taxon:	Common Name	Number	Percent	Number	Percent
Lumbricina		ŧ			
Lumbricidae	earthworm			1	1.9%
Tubificida					
Tubificidae		į.			
Limnodrilus sp.	tubeworm	1	6.3%	İ	0.0%
Mesogastropoda		1		]	
Hydrobiidae					
poss. Fontigens sp. (tent.)	dusky snail	1		I	1.9%
Basommatophora				i !	
Lymnaeidae				<b>!</b> ! !	
Stagnicola sp.	pond snail			1	1.9%
Physidae					
Physa sp.	pouch snail			7	13.2%
Planorbidae					
poss. Planorbella sp. (tent.)	orb snail	1		2	3.8%
Ephemeroptera		1		ĺ	
Baetidae				! !	
Baetis sp.	mayfly	9	56.3%	l	1.9%
Trichoptera					
Hydropsychidae		•			
Cheumatopsyche sp.	caddisfly	1	6.3%	I	1.9%
Colcoptera		Ĭ		<u> </u>	
Diptera					
Chironomidae		1			
Ablabesmyia mallochi	midge			7	13.2%
Chironomus sp.	midge			1	1.9%
Cricotopus bicinctus	midge	1		1	1.9%
Cricotopus/Orthocladius sp.	midge			1	1.9%
Dicrotendipes sp.	midge			l	1.9%
Orthocladius sp.	midge	1		2	3.8%
Phaenopsectra obedians gr.	midge			6	11.3%
Polypedilum tritum	midge	1		4	7.5%
Thienemannimyia gr.	midge	5	31.3%	14	26.4%
Tipulidae					
Limonia sp.	crane fly	1		l	1.9%
Limonia canadensis	crane fly	<u> </u>		l	1.9%
Total Number of Specimens		16	100.0%	53	100.0%
Total Number of Taxa		4		18	

## FISH SAMPLING FIELD DATA SHEET

										pag	ge _		01	
STREAM NAME			SITE NA	AME										
STATION#			LOCAT	ION										
RIVER BASIN			UPPER	LIMIT I	LATITUDI	E/LON	GITUL	E:						
AGENCY			LOWER	≀ LIMIT	LATITUD	E/LON	1GITUI	DE:						
GEAR			INVEST	IGATO	RS									
FORM COMPLETED	ВҮ		DATE TIME		AM PN	- 1	ASON F	OR SUR	VEY					
SAMPLE COLLECTION	How were the	•		k pack I NO	tote b	oarge		<del></del>	Oot	her _				<del></del>
	Sampling Dur	ation Start	time		End tim	ne		-	Dura	ation _				
	Stream width	(in meters)	Max_		Mean_									
HABITAT TYPES	Indicate the po	% 🗆 Pools	%	□ Rui	ns %	□ Sn	ags)	_% %		_				
GENERAL COMMENTS														
SPECIES	TOTAL	OPTIONAL	L LENG	TH (mm	n/WEIGH	T (g)	T		A 1	NOM	ALIES	,		
5. 25.25	(COUNT)				UBSAMPL		D	E	F	L	М	s	т	z
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			+											

## FISH SAMPLING FIELD DATA SHEET

SPECIES	TOTAL	OPTIONAL: LENGTH (mm)/WEIGHT (g)	ANOMALIES							
l 	(COUNT)	(25 SPECIMEN MAX SUBSAMPLE)	D	E	F	L	М	s	Т	z
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# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

	· · · · · · · · · · · · · · · · · · ·			
STREAM NAME	wenter	LOCATION		STA S
STATION#R	IVERMILE	STREAM CL	ASS	
LATLC	ONG	RIVER BASII	<u> </u>	
STORET#		AGENCY		
INVESTIGATORS :			<del></del> _	
FORM COMPLETED BY		DATE OC / TIME //G:	D AM RE	REASON FOR SURVEY
WEATHER CONDITIONS	rain ( showers  40 %GV %cl	(heavy rain) steady rain) s (intermittent) loud cover	Past 24 hours	Has there been a heavy rain in the last 7 days?  Yes
	cle	ar/sunny	<u> </u>	
Ser location/MAP		te and indicate (	the areas san	npled (or attach a photograph)
STREAM CHARACTERIZATION	Stream Subsystem O Perennial  Inte	ermittent 🔾 Tid	al	Stream Type Coldwater Cowarmwater
	Stream Origin  Glacial  Non-glacial montant	O Spring-fe	ed of origins	Catchment Areakm²

# PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

	·	
WATERSHED FEATURES	Predominant Surrounding Landuse    Forest	Local Watershed MPS Pollution  No evidence Some potential sources Obvious sources  Local Watershed Erosion Whone Moderate Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dom  Trees Shrubs  dominant species present Sycamors	
INSTREAM FEATURES	Estimated Reach Lengthm  Estimated Stream Widthm  Sampling Reach Area/D^*O^*_m^2  Area in km² (m²x1000)km²  Estimated Stream Depthm  Surface Velocity O.5-/.Om/sec (at thalweg)	Canopy Cover Partly open Partly shaded Shaded  High Water Markm  Proportion of Reach Represented by Stream Morphology Types Riffle 25 % Run 50% Pool 25 %  Channelized Pes No  Dam Present Pes No
LARGE WOODY DEBRIS	LWDm² /\A_ Density of LWDm²/km² (LWD/ rea	ch area)
AQUATIC VEGETATION	Indicate the dominant type and record the dominant Rooted emergent Rooted submergent Rooted Submergent Attached Algae dominant species present  Portion of the reach with aquatic vegetation	Rooted floating
WATER QUALITY  See Delande	Temperature° C  Specific Conductance  Dissolved Oxygen  pH  Turbidity  WQ Instrument Used	Water Odors  Normal/None
SEDIMENT/ SUBSTRATE	Oxfors   Normal   Sewage   Petroleum   Chemical   Anaerobic   None     Other   Oxfore   Oxfore   Profuse   Deposits  Sludge Sawdust Paper fiber Sand Cledict shells Other  Looking at stones which are not deeply embedded, are the undersides black in color? Yes No	

INC	RGANIC SUBSTRATE (should add up to					
Substrate Type	Diameter	% Composition in Sampling Reach		Characteristic	% Composition in Sampling Area	
Bedrock	Instine	80_	Detritus			
Boulder	> 256 mm (10")		]	materials (CPOM)	(trave)	
Cobble	64-256 mm (2.5"-10")		Muck-Mud			
Gravel	2-64 mm (0.1"-2.5")			(FPOM)		
Sand	0.06-2mm (gritty)	io	Marl	grey, shell fragments		
Silt	0.004-0.06 mm	10				
Clay	< 0.004 mm (slick)		]			

# HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME SNOW CRUSK	LOCATION JC-STAS
STATION #RIVERMILE	STREAM CLASS
LATLONG	RIVER BASIN
STORET#	AGENCY
INVESTIGATORS	
FORM COMPLETED BY  VKS / SML   SPT	DATE OG (12/6) TIME 16:50 AM PM REASON FOR SURVEY

Su Av	Parameter  Epifaunal ubstrate/ valiable Cover	Optimal  Greater than 50% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are	Suboptimal  30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for	Marginal  10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Poor  Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
Su Av	ubstrate/	substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are	habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but	habitat; habitat availability less than desirable; substrate frequently disturbed or	habitat; lack of habitat
SC SC	_	not new fall and not transient).	colonization (may rate at high end of scale).		
ـــا ۲	CORE (7	ng aver Henrich	17.009(17.01)		
	Pool Substrate háracterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All rnud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SC	core 4	Business Safer	also all the same		
3.	Pool Variability	Even mix of large- shallow, large-deep, smail-shallow, small- deep pools present.	Majority of pools large- deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small- shallow or pools absent.
sc	CORE /5			7.7	
4.5 De	Sediment eposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SC	CORE / 1				
	Channel Flow atus	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
sc	CORE		DESCRIPTION OF THE PROPERTY OF		

#### HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

	Habitat		Condition	Category	
}	Parameter	Optimal	Suboptimal	Marginal	Poor
	6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	SCORE			FIVE PARTE SHAPE	
pling resch	7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note-channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
S a a	SCORE (				
Parameters to be evaluated broader than sampling reach	8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30- 60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
be evalu	SCORE D (LB) SCORE D (RB)				
Parameters to	9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	SCORE $\frac{1}{2}$ (LB) SCORE $\frac{1}{2}$ (RB)			14,7,24,7 V (* 1 )	
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6- 12 meters; human activities have impacted zone a great deal.	Width of riparlan zone <6 meters: little or no riparian vegetation due to human activities.
	$\frac{1}{\text{SCORE}} \frac{1}{2} \text{(LB)}$ $\frac{1}{2} \text{(RB)}$				

Total Score 71+54 = 125

## Benthic Macroinvertebrates Collected by BBL Science for Project Number 10213.001 (Alabama).

Sample Date:	10,13 June 2005 Kick Net			**	Master Lis	st"		
Sample Type:	MICK INCE			S	ample Stat	ion		
Taxon:	Common Name	RP-01	SC-1	SC-2	SC-3		SC-5A	SC-5B
Lumbricina							•	
Lumbricidae	earthworm	,						1
Eiseniella tetraeidra	earthworm	1			1			
Tubificida		1						
Tubificidae								
Bothrioneurum vejdovskyanum	tubeworm	1	i	3				
Branchiura sowerbyi	tubeworm		3					
Ilydrilus templetoni	tubeworm		1					
Limnodrilus sp.	tubeworm	1	23	1			1	
Arhyncobdellida		ı						
Erpobdellidae		1						
Mooreobdella sp.	leech			1				
Rhyncobdellida		1						
Glossiphoniidae		1						
Helobdella papillata	leech	2						
Mesogastropoda								
Hydrobiidae								
poss. Fontigens sp. (tent.)	dusky snail							1
Basommatophora	adony onan	Į.						•
Ancylidae								
Ferrissia rivularis	limpet snail		3					
Lymnaeidae	imper share		,					
Stagnicola sp.	pond snail							1
Fossaria sp.	pond snail		3					•
Physidae	pond snan		3				İ	
Physa sp.	pouch snail		9	1	1	1		7
Planorbidac	pouch share		,	ı	•	•		,
	orb snail	1		1				2
poss. Planorbella sp. (tent.) Veneroida	oro stian	1		i				2
Sphaeriidae	=ill alam	1	2					
Pisidium sp.	pill clam		3					
Hydrachnidia Limnesiidae								
		12						
Limnesia sp.	mite	13						
Decapoda								
Cambaridae	C -1		,					
Orconectes sp.	crayfish		1					
Ephemeroptera								
Baetidae	8	1		0.7	2	2	9	
Baetis sp.	mayfly	100		27	3	3		1
Callibaetis sp.	mayfly	120						
Caenidae	~							
Caenis sp.	mayfly	3						
Odonata		1						
Aschnidae	_	1						
Aeschna sp.	dragonfly	8	6					
Anax sp.	dragonfly	1						
Coenagrionidae		1						
Enallagma sp.	damselfly	54	7					
Ischnura sp.	damselfly	1	14	1				
Libellulidae (early instar)	dragonfly	1						
Erythemis simplicollis	dragonfly	3						
Hemiptera		1						
Belostomatidae							•	
Belostoma sp.	giant water bug	4						
Corixidae		I						
Hesperocorixa sp.	water boatman	1						
Sigara sp.	water boatman	2						
Gerridae		l						
Corridate								

# Benthic Macroinvertebrates Collected by BBL Science for Project Number 10213.001 (Alabama).

Sample Date: Sample Type:	10,13 June 2005 Kick Net			"]	Master Lis	st"		
• • •				Sa	ample Stat	ion		
Taxon:	Common Name	RP-01	SC-1	SC-2	SC-3	SC-4	SC-5A	SC-5B
Mesoveliidae								
Mesovelia mulsanti	water treader	6						
Naucoridae								
Pelocoris femoratus	creeping water bug	9						
Notonectidae		2.6						
Notonecta indica	back swimmer	36						
Trichoptera Hydropsychidae								
Cheumatopsyche sp.	caddisfly			17		1	1	1
Coleoptera	caddisity			17		1	1	1
Dytiscidae								
Ilybius sp.	diving beetle	5						
Haliplidae	S							
Haliplus sp.	crawling water beetle	2						
Peltodytes sp.	crawling water beetle	1	1					
Hydrophilidae								
Berosus sp.	scavenger beetle	- 1						
Tropisternus sp.	scavenger beetle	22						
Elmidae								
Stenelmis crenata gr.	riffle beetle			6				
Noteridae		,						
Hydrocanthus sp.	burrowing water beetle	1						
Diptera Ceratopogonidae								
Atrichopogon sp.	biting midge			1				
Palpomyia gr.	biting midge	4		1				
Chaoboridae	omag mage							
Chaoborus punctipennis	phantom midge	1						
Chironomidae 1	. 3							
Ablabesmyia mallochi	midge					l		7
Chironomus sp.	midge		1					1
Cricotopus bicinctus	midge	1						1
Cricotopus/Orthocladius sp.	midge							l
Cryptochironomus fulvus gr.	midge			l				
Dicrotendipes sp.	midge							1
Endochironomus nigricans	midge	6						
Larsia sp.	midge	10	2					
Natarsia sp. Orthocladius nigritus	midge midge		3			1		
Orthocladius ngritus Orthocladius sp.	midge				4	4		2
Parachironomus chaetoalus	midge	5			•	•		2
Paratanytarsus sp.	midge	1						
Phaenopsectra obedians gr.	midge		3					6
Polypedilum tritum	midge							4
Stictochironomus sp.	midge		2					
Tanypus sp.	midge		1					
Thienemannimyia gr.	midge		12	45	7	17	5	14
Culicidae		_						
Culex sp.	mosquito	5						
Empididae <i>Hemerodromia sp.</i>	dance fly			ł				
Stratiomyiidae	dance my			í				
Odontomyia sp.	soldier fly	1						
Tipulidae	solutor my	1						
Limonia sp.	crane fly							1
Limonia canadensis	crane fly							i
T ( ) N - 1 - CC - :								
Total Number of Specimens		331 31	97 19	106 13	16	28	16	53

**Field Notes** 



Wildlife Codes

Ct. calling Fh= flight

FG= foraging FE- feeding

RS. resting or perchang

SC. Scat SL-Rlide DHB-den, hut burrow TR: tracker DB=day bed CA-call NE-rest FG: browse/frage

GlA Oversælet harry horns herkelsee kartin

DETAL OBSURVATION TIME

LED MIN TOTAL OLIVET ON

TRANSLETION (

D SEND DAVE BENTHIC SHELTS

Reach #1 9:40 the 6/10/05 JKS

Sunv Creek

Barn Swelling Flying over

CW Blackfield styring on vegalory

creek.

Mackine hild take in free over

creek.

The swellow flying over area

just about and

flux veg has been

recently cut beck to 10ft of

water.

from bank edes in upper sector di wach (peran)

emuique on bank.

chamielised et ream with sport

Gwyler-Terrant Park Altyahr wad extends, out firm each varing distances into 701 Aw : aliques west ciecle. mosting @ -6' out from sider concert. crayfish borows flack of 5 stanling greater in cut grass on east side placement volin-Rs CA FL a make of of gradde. (E mushrat runs spike rush. Eost Seboca luge take poles 33 39 41.0 8**5** 50 51.9 bern swellows asstiry under both Flord v 6 over ereck bottom

Væld leaf. Virg. Brever chung swift flying over creek ketwen trees. american toad in grass Barbara's Buttons - Kershallia trinervia v Daisy flowbane 2 ground aut 2 Brazilian verbena 2 w. either 2 Soft rush Spike rush 2 9. Prun ose Broad leaved Cattail 2 6 6 ook 4 rome Battere up Primose Pathe Bush 2 weda penny e gout Raqueed. 2 sweet white clover 2 Red Clover. Gox Sedel v BHErdock 2 Common Plantam GALLE BUX ELJEN Syc. ciù/ vetch print to a Pye weed

Snow Creek 2 -Rock Dove FL Ethere Sparrow RS Moching bird ex lower lunt 33°39'08.5" 85°50'13.3 lobri CA EL Starley FL cut, day TR quarble CA FG Mruny Dor Rs

catbird CA

muchant borows around man hole

16 nacy 2 dond l'un cut Ti, 6th Sheet 73

and huldering 13:40 up 33 38 242 most of flow CTUM 85 49 46.6 suallan water. 85 49 46.0 in willow rain-on and offprofit 1 80-100 Qu makinbird ex 140-50 high starling cathirl 36 reckles bather Cardwal Diarolina Chicada Co vat. TR Kolein FE empties into the sixtien

Trees / sheets. Trusa both Box Elder sider ar Say of work v->⊃ Catalpa Juralson 00: Stoney Elm Silver Meiple Shear True met Creeken Municsa set ray auros ioac Easter Led Junion due to dence causey

Kingfisher was sitting in tree when we arrived up stram is concert lined stream covider. hother sides and botter A metal salvage yard is just upstream. not TR mushrat TR

Trus. (west) wall lange stas exposed entes outful Parkin hot BALL

for grape ped medbay. Frost gape goldereds B. versen Vap. honeysude Com. Plainten Vin weed red top grass Kutzu q. rague,d con vetch tirld lettree with dode clear weed oath. rushued. soff rush sing pum resc sufferey pumose 6. speciosa with lettuce light hower - Clematis virginiana red, top-grass munosa Silver maple Pelcan a pum rósel

16:14 The continue Form CA morn water sample under celf benes V 3 37 00.9° 25° 49 32.1" 33"36 543" 85 49 349" TZ

frest gløpe 9. Fih Vilott? Stor hage Eldabern Bredda Sye. Lundon Keb hankeng T, Creepin B, Verin Rictor gur J. Honganh SCTSTI green frogs crayfish cooler colon moseth much trulle during samples dong fishpat flying over and volen pulling nets at uppe mush rat owning in eigek while sorting fish samples.

SC ST-4, 11:30. Fishingalicai -

Cloudy light boring. stacky mockey sirl barn sulla

yall coast soft well truste 1. 4x 4.5" carpace 2 line, salamander copperhead snake 12"

SC 37-5 13:05 - 15:00. clouder light round light would auf west soft shell vivi Kingfisher- Fo

rain hall wind. SC ST-2 7:23 Thee Sur to feeling ornereck Been Swaller feeder evacuel Cardual Kobri herbig vorneg und nest building Ish shocking

F

SC ST-3 91:4 -11:00

6 bain swellows nests

fish shocking.

50 Statu 1 13:43 6-12-05 - cloudy- 10.20 mph wind Blue Jay in trees.

Transcot 18. Bank. 33° 39'41.1"
85' 50' 52.4

15 open wage 6' Aweed 4' seder ~ 4' high 40' clover dominated field

Transpet 2 & Bonk 33 39 42.3 85 50 54.1

20' open wetr Steep hank 4' lugh 2' wide Sedge/6. Egwad, doct 40' clover dimnated field 6-12" lash Eurprey 50'-60'high from one tree

10' steep slope up to 10' lugh, slope ist cut downahad red clover. B. recon 40' cut clover field 6.12" high with 10190 canopy cover for plusin 136"dbh 50-60'hirth.

Fransect of West Bank 33 39 40.0 85 50 526 ion the

10 open wak - c" deep 10' steep slope 10' high

SC Statui 2 14:48 width Transcet 1 west side 20' Open Warn with 33 39 08.1 85 50 12.6 10' super) slope up to 10' 20' open water 5' transit, 10'up ferry water undert drivated by grasses 40 cut fiell housegrasses elover Fransest + east 33 39 08.8 Transcet 2 west 15' open with 33 39 07.5 85 50 11.2 with 20' com Wah 10 shipshops t'up to cut lun 10' flood plain 4' above uset 40 Jaun cut 30 uneut nouse for suppling BW shrub MER 30' aut tiele, 10' havings detch wall with Street.

Transect 3 cart, 33, 39 08.0 85 50 11.1 BUX Edey. Saning Elan 30' mirroed (arm not well 85 50 13.1 20' flost plain 4'up fern næter.

DC 51-3, 15:30 Brown Thrash FG Transact 1 west 33 38 25.6 85 49 46.4 30' open water 10' wide flood plain that reser up 6 fina week. 30' high can ogy which extends across stream muy. Syc. Bur elda- handia hallithon 6 large rock ripray for stablyaban RP 6' to sail, load tracks. 3 sets of tracks. Transcet 2 west 33 38 24.3 85 49 46.2 30' open war 6 trued yard 10 30' high trees canopy augs with. driniale Syc Boxelder ERC pattrie pearl NH 10 treated with heibiale for sits of RK. 

Struck your steelding and struck your wide there area 30'40' high steep boxenber Sye. To H Clunchern, munosa' S. Hacleberry

S. purit elderleur trupal erceper

SC ST-4 - 15:54 clear sury- 10-15 night wind www lower end pt 33 37 39.3 1000 open with 33 37 41.8 85 49 42.3 85 49 41.5 Traul EAST- 33 31 40.2 85 49 41.8 40' open wohn 10' steep usin 201 bein cut sayling evering in. Sye TOH humins 5. Elm. ing myed quesses ranget 2 East 33 37 41.5 85 49 42.3 40' open water 10' flood plane visus to 4' Syc plack wills 10' reser steeplen for up 15'
12' moved area to asplat
parking lot.

steepert of clope and

Junk yard.

mature hedge now healthat on
steep slope in 25 H

the 40 60' legh trees.

Steep Burelder Blank willton

privil Selin, Please
exents out approximately

18

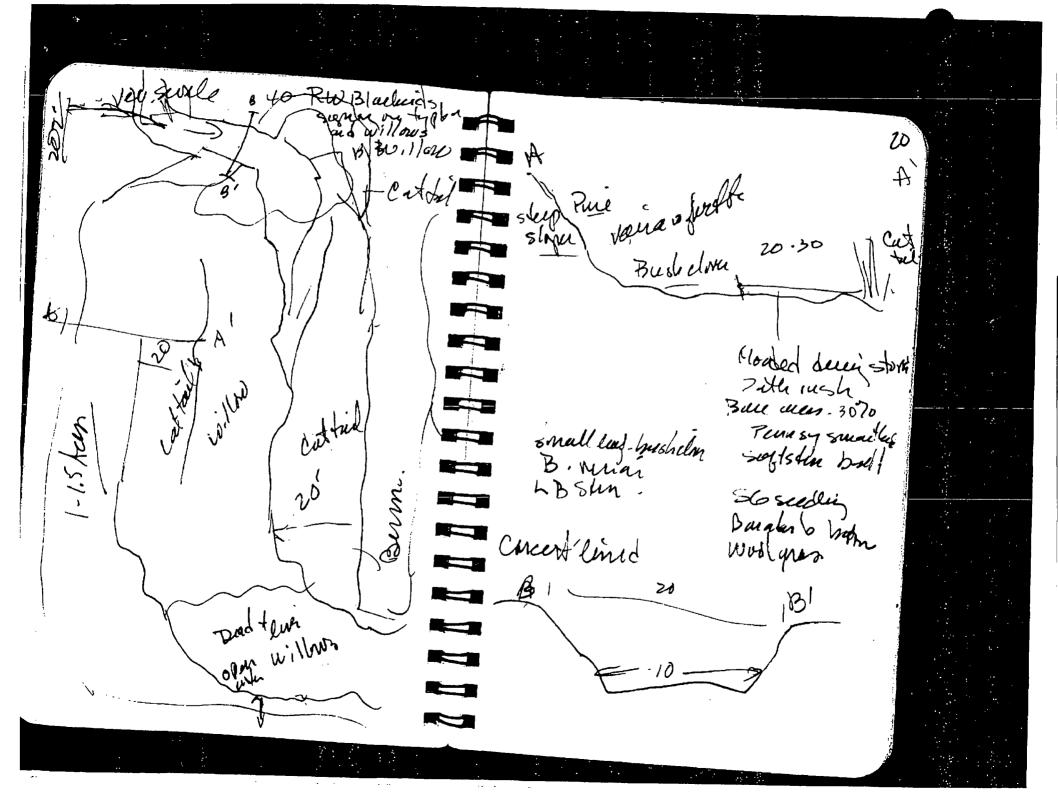
De 375 16:45 clear sunny 10.15 mysh new lower and 3336 58.9 9549 31.8 T. Lauset 1 W 33 37 00.5 85 49. 32.3 90 % canopy of stream just below falls. 30 open worken 10' verti al my 20' tree have been ent teleplone 40-50' high St human Brolde. Importenza fros grape 20' de fir 11 that is pero Lical purling lot

Nansed 2 W 33 36 54.5 85 49 31.7

30' open wath usta big
20' comes up to' in kight
vegetalab with thees
50' 60' that have been
cut for telephone wires
siver hayles huminia Box E
privet TOH
Asphalt parking (H.

East site half of the side has been summed of thees - reforced with ement fill and well frest area has been treated on Roel was with herbitate some vey and height

vi llow 6-13-05 Tracu m - 1/102 Chung Suft getty with y pear willow organ m tree . Ban Suellar could - Area is fenced - & for high an withway walkway RP on with keep events rheins 



fund a mowed of neadow moure William C. Ray. Colfael BW llow SH sp. bour . Daty Cleabour swale with Red Clase B. Dlackery Brasid

Estail hank en ova strurala fre. TI- 33 39 105 85 50 53.7 Dead & with castal stru up twelfal fact megand hyderis mon gelove 34 11.7 85 50 56.1 D. Li lord his ben clew of in sweed (onten muss. s. elm.

DNIS down several times enfert unhat und trutte pop. area is dof- Trust to colonze belause & with correspon to the showing pueden is and with control STULLALLE. 

2 fining tores on wries

2 fining tores on wries

31 blue bein on wrie

1 supporting on fence

1 Supporting of the At Harth

Over tracks. in les. vrt.

Juffle

Enthandfill 7:20 19,4/05 clear-surrey 50 going + 904
Burn surellines FG war finds.

Attante instrue pein classed by awaken bird outside fune e umen jarager in tress triss Bunts fly euros cardinal Ilyin across

Shut End TA 35 38 56.2 85 51 00.5 33 38 57.6 85 50 55.9 3 Lev Edserwits flew into minna tiller 2 Buse day few outo frestedy 1B 33 38 566 33 38 579 1 Starley 85 51 00,6 85 50 56.1 Bu blad I you over Bugo bunter in fortet edge Te 33 38 56.9 13 38 58.0 85 51 00.5 85 50 56.1 2 Red Tail abult flying over on termel trappet ~ 13 m a jart clover/grasfilld in ugh des vine Daugherbert nem onon - Chinese SIX tree Ansie A 35 35 54.6 33 3654.5 Cquid on 33 54 53.7 33 38 54.1 35 51 01.9 85 60 584 no signs of wildlift pursels 33 38 53.3 3338538 85 51019 85 50 584 nother.

25

opens in tall feel of glass. tunget orecper-Valer weed Dock cat been caiseral flui users.
Ru bludebud, four across Pluma Down lear acres

parrow Hack picked de

possible grass hoppe and

four

summer Janegu 9 per coop Ru Bluckby P Jaw Suces 

de vir

Shouting Conque forl

o readed cowmed it is la surford Harck sedin from 2" dia (borow) in whenter stream corrida Jelepleze, pole - 1 Armindela borroury nea Sureld be the sace one RW Machbud feeder in he was Ground is coulded with filter fabic with will lambel 27 Hay's flying orce with with shirthey the Ho sest and Cero. and borowing aminals which horars who fence in Daw wellow sign of smoth matrial. 10:57 40'-50' canopy-of a member of Stant Zud. Juls. no skint 10% S6) Peron Willow Oak ster Truken Oak SCO NOON'S VC SHA Dunken a Dinker as 33 39 02.6 33 39 00.4 85 51 09.1 55 5109.5 TB 53 39 02.2 23 39 00.3 notion tent correst fund use as 85 51 09.0 85 51 08.7 IC a park for employees. 10 33 39 63.1 St To comage of herbs que 33 .39 .00.4 85 51 085 85.21079 privot, a, colk grass crafe werter 

.

many partly doudy 90+ no wound 22 huxed mondal fill por high clover yard - FMC-2 while clive - recovered to 22-4" . 100 %, cover Rid Clover OAL C. darition- Crategran Moren Deves on wies Swett White Clocker Suck Y. clark Dasin fleatour Golderods?.
Con plantaen Lervis.
Ansursa her vis. F6 3 EPR seedling) dogwood? TIA Touple Uppland Brost a clove - C (Mainten) 2-4" high Bimida Grans
100% o Corelle Meadon fack sitting post The stabling post The file of no willife

Box Elder. Syc. Minionia Feren S. Elm B. Willow R. Leulbern Price S. Hackkerry Cat Silver hade E. Rid Cedan hele of Haven Macolca China berry Bullion Bunella Oreen Joh 

1 2 3 4 5 R V X X X X V VXXXXX  $\times /// \times$ VXXV

sturits B 123 5 Elderberry Harthour Proit 

Rite in the Rain®

#### FIELD

All-Weather Spiral

SOLUTIA ANNISTON OU I E OU Z E OU 3 HABITAT / BIOTA SURET JUNE 2005

ъл x 7\* - 64 Pages



Pine Environmental Services, Inc. www.pine-environmental.com

06/09/05 PRE RECON SURVEY GAYNE MACOLLY CREW! SML, JKS, SPT 5.08 PM P 256-231-8412 50-57791. LOCATION WAYNE LAMBER BUMES 144311458 BMI ALLIGHTUR WEED (1) P. 256-231-8400 5ANO/CABBIE 6" (2) - II 5Ano 1 224" (3) SHETY TRAWILL POURLO HAYNUS (M-FILE SAMORE) F154 P. 256-231-8497 WILDLIFE -TOM COLLINS COM PART FRANCE BN. SWALLOWS, SWIFT P: 256-231-8490 544 FIR CHERGENCY / LOCATION PEOPLE GUARD AT SOCUTIA CATE 11 11 11 5:38 pm 5c-5142 P.256-231-8408 >100 M LUDWIL (2) RUN/POOLS UPSTREATED HOME. 1 ESH PRESENT: SUN PERSON CUL

BUE SKY 80% CLOUD OBSERVED SHINERS / SUNS LET/RT BANKS EMSTELT ASSEBLED; MUSKIZAT, START 20M BOZOW 14TH STREET END D SMET OF ALLIENTER WEED. BMI (1) RIFFLE DOWNSTREAM OF BRIDE WILDLIES LETIRA BONUS / HORDER ACCESS, ONLY ACCESS 15 UP FRM BRIDGE

06/09/05 06/09/05 7:00pm 5C-5745 6:00 pm SC-STA 3 BMI LIMITED SAND BETWEEN BMI QRIFFLE /1200 ) MINED LEDGE, GOOD ProUS, SMALL 2) SHADED Y UNSHADED RIFIELDS; BOULDERS SANDY / ROCK (Poor) ROCK (RIFFLE)\_ FITH PRESENT / ABUNDANT PRESENT F15 H WILDLINE : POSSIBLE TO DO BOTTH BMUS, ACCESS IS STEEP WILDLINE GOOD NECKS FOR THEISE 7 RIPARIAN COULR CRACKE; KINTERISHOR on aust save pool ACCES ON GAST BANK 2/10/20 7:20 pm END OF DAY GRACKIE MKSIED - Ed -BMI (1) NICE RIFFLE / SMALL SUMMON POOL REACH \_ OGEAR POOR NOME NOBLEST. BRIDGE (3) SIMDED EMPLY PM ->> sow in me PREZENT WILDLASE ROCK DOVE BN SWALLOW

06/10/05 06/10/05 FRIDAY MOBILIZATION 8:00 -Reach 9:40 middle of reach WEATHER: CLOVDY, 79°F LIGHT 5 5E WINDS HURRICHAE APPROPRING cml 6,332 SHUL O BE HERE TOMORROW PMS trib. 0.0 DO. 10.36 CREW. SML, JKS, SPT tem. 23.5 THISK BITECTON, BUT, WILDUITE SUCCES ORP 277 with vel. 1.13 ft average of 56. (post humanc) BIOREUN STATION/SC-STA) TASK 1 SAMPLE read incs 20 jals 2 SANO (RECON) 4 JABS: ZYCOPPERA ODOWATA (COENTREPIO) 61751200005 SIMULIONE (PIXA?) 3-4 ODOWATH (COENTHERN) BAIL PAIT : CHIPCHONIP FISH FRY CHIRONOMINO NEMBEROOF SIMULIONE ( blk fly) OUGOCHAETH JAMPLE SC-STAI PRESCRUED coleap tevan 70 % commune, 4mi GLYCORECE 3-4 Fry 5+ GASIROPOD! 1115 MEUT LARRY LYONS & SOLUTIA GFE TO STAI FOR HES/ DUBRICK

06/10/05 SC-50 ST 2 12:06 arrival 06/10/05 12:50 20 JABS waler sauple in undale of seekin - 10 in SAND ROW (RUN) 33" 39' 08 0 65.50 -10 in COBBLE (RICPLE) 1/ Collemoreren (?) flow ft/sec GP/12mcRoPDA ALL WARLY INSTAK NG 8.30 1 CERCH mar popular Preserval 0.328 cond. 4,3 5MULIDAE Trub ferm 24.5 230 ROP 4 JABSS (BIOREZON) 12:30 2 SAND/ROCK (RUN) 2 COBSIE (RIFFLE) BMI / PMI: Z460 3-4 GOOWATA (COEN) THEN 2 SIMULIDAG 2 TANYPOOINAG GUILOU WASTA preserved 75% stort 4 mil slyceral

06/10/05 13:42 SU-573 P 6/10/05 33' 28 27.5 85" 44 4/2" 14:45 END OF STATION vul. 2.79 H/see ARRIUN SC-5+4 14:54 0.257 C MARCO turb 3.2 33 37 44.2 85 49 44.1 Meng. L8.9 85 49 42.1 bottom 330 37 4/3 9.28 usahu couple at bottom of rouch TOP 113 4 JABS (BIORECON) vel 4.83 H/sce 1400: 1 RIFFLE UP 8.64 POOL UP Runing . 0.256 RIPFLE AN tent 5.1 ten? 25,1 ROP BMI : 15 + SIMULIDAE 192 THIN POPINE 4 LICUS/JABS KICKS/ (BIORELOW) 2 RIFFLE 20 JABS PRESERVED 1 waster miss 5 MANY PODIAME 75% ETON NOTE: LARGE STORM WATER OUTSACE OLIG OCHMETAN glycard . PRESENT, EVERYTHING UPSTREAM EPHEMILROPTERA KITTLE (100 M TO NOBLE STRUET 1 ODONATA EXORUMENT ANISOPTORY

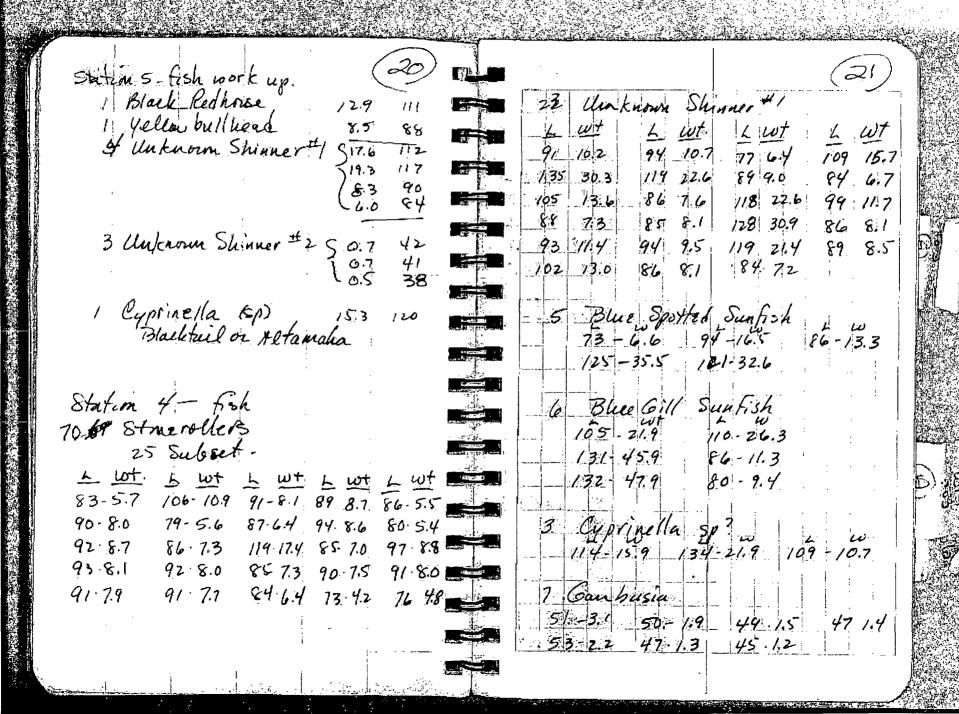
06/10/05 06/10/05 5C ST-5 EVERYTHM, DOWNSOMERON 16:14 RUN IMBIANT (FOR 50 M WWITH CHAME TO EXITLE). 2.82 Ct/see Lau BMI ! consuprosed 8.03 2 marporiano 0266 cond 2 SIMULIBAR turb, 21.7 CPHEMISROPTERI 8.45 24.4 teus. 20 KICKS ROP 14 KICKS BMI 5 SIMULIANE MAYELY (ESPINEM) MANY POMINAE 1 THINYPOS EXPHEM 600 OP TONE 1 TRICHOPTERA 645TROPODA UPPRIOUS GROSKELETON 20 KICKS 2 ROOT MATTS UNDERCOT 3:50 two smanin 9 SAND 8 COBBLE ALGAE (4 EPHEM) DUTKITUS (DIDORCE) OBSERVED MUD TUBES ( OLICOCHALTE?

06/10/05 66/10/or 7 EpHemorepret 1500 Erecre os roceme 2 MANYPUDINO weaported consine of same can SIMULIA ME GASTROPOD! 150-15741 TRICIAPTORAN. 06160C 411811 SET BOOK NETS APPRINCH : SHOCK DOWN -> UP. SENDIN TO LAB BAIL SAMPLES LIVEWORL CATCH work up CATCK 50-514 SA (MANGE HABITHES) 5 MO (ROCK) ALGHE 5mm TIME: 1900 SC-STASB ( SMALL DETRITUS MED END 11ME - 20.10 COUDSE CUT AMES) WATER OUTER MOASUREMENTS 18:00 eno or STATION. TOW DIS COND TURE DO ORF TEMP 0.52 828 0.324 07 827 222 251 TOTAL SHOCK TIME 23.86 AVE AMP 3.0 VOLTS 1 2001

CATCH: 100 TANPONES CAUGUT 67 64+ OBSHRUGO) CRAYFISH Livery (man) 55+ OBSLEUBO) 47 I SOUTHERN LEOPING 19806 40 45 43 VOUCHE 1: 5C-STAI LET (INCH) BLUESPOTTED SOW 313/14 14.8 4 1/16 113 65.3 N= 85 cours 2 4.6 2/2 11 33/4 10 3 15/2 00 B 12.5 10.8 3 % 11% 9.4 33/4.15 4.4 3/4 13 31/4 63 7,1 31/8-19 5.8 3/2 4 8.2 0.6 3/2 11 4.8 35/8 7.6 3/4 6.3 1,0 37/1 47 7.6 5.4 3/9 TOTAL CARH GAMBUSIA

06/11/05 06/11/05 FISH SURVEY FINISHON SHOCK 9.09 MERCYGD STAZ 7:23 LARCY LYONS TOTAL SHOCK TIME 21.46 CREW: SME, NKS, SPT ! OVERSIGHT RATE IN WEMPITER: ARLEWE APPROACHING PAST CATCH OBSERVATIONS RECORDED FIRST BAIN BAMOS WERE-2" XMEZ, AND EXPERIED temp hefre often TOOAY - F747 77 RUN : 2 CRAYEISH 13 TADAUCS PHF 19.9 7.16 7.00 person ( 10.21: 10.08 20.3 0410 RIMITLE : 3 CRAFFISH , TROPORTE, 4.16 4.08 0H4 20.4 turbo 20.4 2.4 0.0 750 (wen't calchinate) trib100 20.5 72.3 RECORD CATCH LATER IN THE 1.59 1.40 20.7 card DAY WHEN HEAVY RAIN WATER QUALITY 930 ARRIVED 50-574 3 water quarity 2.58 F/s FLOW AHT Cluo. 22.6 temp porto temp 7.70 pp p4. coul 0.288 Cord +urb 0.0 - Justin 100 + sh d. o. 6.16 const 10. 242 orp 248 OYP

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melo 03 (come) 12:35 OPEN MEGA 01 3339 02.1 0A-01 (SWOOP) 855/08.6 11.6 12:40 33 38 01.4 MF6-01 Mrs - 04 (come) (core) 85 51 10.0 33 10-0 35 33 3 9 <del>02 +</del> 03.8 12:55 MF6-02 85 51 00 13.8 (core) MEG ON (core) MAINTAINED PACILITY WILDLIFE OBSERVATIONS 33 39 08./ TRANSECT A 855/ 1210 -33 35 110 85 51 11-6 1.30 lear, WFG SHART 33 3₹ TRANSECT B 08.2 M 3339 11.0 85 51 11.3 8551 11.2 TRANSECT 6 33 39 08.2 85 51 10.7 3335 11, and observations fire ants

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Appendix B

BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

Appendix B

Fish Sampling Photograph Log



Fish Sampling Photograph Log
OU-1/OU-2 – Anniston PCB Site
Anniston, Alabama



Description: Crayfish from SC-STA1



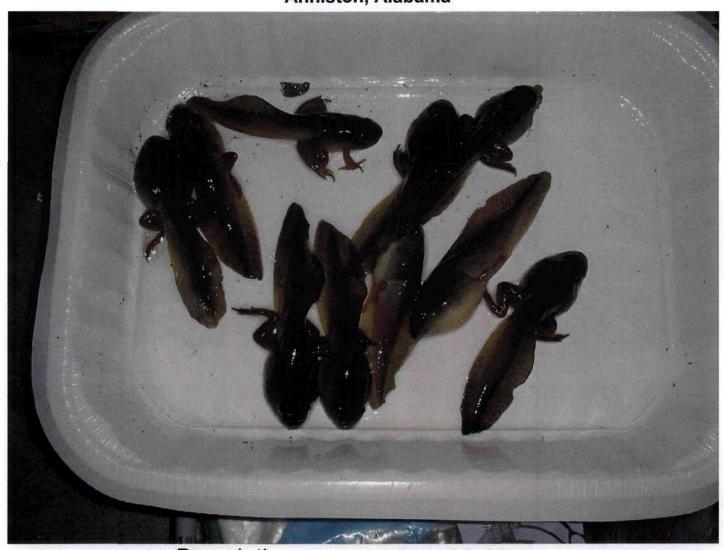
Description: Mosquitofish from SC-STA1



Description: Stonerollers from SC-STA1



Description: Sunfish from SC-STA1



Description: Tadpoles from SC-STA1



Description: Unknown fish from SC-STA5



Description: Notropis sp from SC-STA5

Fish Sampling Photograph Log
OU-1/OU-2 – Anniston PCB Site
Anniston, Alabama



Description: Shiner and catfish from SC-STA5



Description: Sunfish from SC-STA5



Description: Sunfish from SC-STA5



Description: Assorted fish samples from SC-STA5



Description: Assorted fish samples from SC-STA5



Description: Fish catch from SC-STA5



Description: Stonerollers from SC-STA5



Description: Stoneroller count from SC-STA5



Description: Processing fish samples from SC-STA5

# Appendix C

BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

Appendix C

**Scientific Collector Permits** 



	STATE DEPT. OF CO NATURA
This Permit Author	izes STEVE
Of BBL INC COMPANY	
to take and poss purposes under department.  3322 Number	
STATE OF THE PARTY	STATE DEPT. OF CO NATURA
This Permit Author	rizes JOSEI
Of BBL INC	
to take and poss purposes under department. 3323	

STATE OF ALABAMA DEPT. OF CONSERVATION AND NATURAL RESOURCES  This Permit Authorizes STEVE P TRUCHON  Of BBL INC BEVERLY, MA COMPANY COMPANY COMPANY COMPANY COMPANY TO take and possess species indicated for SCIENTIFIC purposes under the rules and regulations of this department.  Page 12.20	Amphibians Invertebrates  Birds Mammals  Fish Reptiles  Other Species as Listed Below  Issued: 6/8/2005 Expires: 6/7/2006  Report MUST be received by Jun 06
Joeanne St. John, Issuing Agent For Commissioner of Cohservation  STATE OF ALABAMA DEPT. OF CONSERVATION AND NATURAL RESOURCES  This Permit Authorizes JOSEPH SHISLER Of BBL INC COMPANY CITY STATE to take and possess species indicated for SCIENTIFIC purposes under the rules and regulations of this department.  Joeanne St. John, Issuing Agent For Commissioner of Conservation	before renewal permit can be issued  Amphibians
STATE OF ALABAMA DEPT. OF CONSERVATION AND NATURAL RESOURCES  This Permit Authorizes SCOTT M LAREW  Of BBL INC COMPANY	Amphibians Invertebrates Birds Mammals Fish Reptiles Other Species as Listed Below  Issued: 6/8/2005 Expires: 6/7/2006 Report MUST be received by Jun 06 before renewal permit can be issued



December 23, 2013

#### Solutia Inc.

702 Clydesdale Avenue Anniston, Alabama 36201 USA

+1.256.231.8400 phone +1.256.231.8553 phone www.solutia.com

#### SENT VIA FEDERAL EXPRESS

Ms. Pamela J. Langston Scully, P.E. Remedial Project Manager Superfund Remedial Branch United States Environmental Protection Agency Sam Nunn Federal Center 61 Forsyth Street, S.W. Atlanta, GA 30303

RE: Revised Streamlined Ecological Risk Assessment for the Operable Unit 1/Operable Unit 2 Portion of Snow Creek
Anniston PCB Site (Docket No. 1:02-cv-749-KOB)
Anniston, Alabama

Dear Ms. Langston Scully:

On behalf of Pharmacia LLC and Solutia Inc. (P/S), as parties to the Partial Consent Decree (PCD) for the Anniston Polychlorinated Biphenyl (PCB) Site (the Site), enclosed please find eight hard copies and 10 electronic copies of the revised *Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek* (OU-1/OU-2 SERA). This document is being submitted in advance of the Remedial Investigation (RI) Report of OU-1/OU-2, and together, these documents fulfill the commitments made by P/S, who are signatory parties to the PCD for the Site, to provide an RI Report that summarizes the risk assessment for OU-1/OU-2, among other requirements.

Revisions to the OU-1/OU-2 SERA reflect resolution of comments from the United States Environmental Protection Agency (USEPA) on the June 6, 2013 version of the OU-1/OU-2 SERA that were received by P/S on November 25, 2013. Many of the comments received from USEPA indicate that a specific change to the OU-1/OU-2 SERA is not required but that the comment be considered in the development of the OU-4 Baseline Ecological Risk Assessment (OU-4 BERA). A response to comments document is provided along with the revised OU-1/OU-2 SERA to clarify which comments have been addressed in the OU-1/OU-2 SERA and which will be considered as a part of the OU-4 BERA development.

Please contact us if you have any questions.

Sincerely,

E. Gayle Macolly Manager, Remedial Projects

Mr. Chip Crockett (ADEM) cc:

Mr. G. Douglas Jones Esq. (Haskell Slaughter Young & Rediker, LLC)

Mr. Thomas Dahl (Dahl Environmental Services)

### Introduction

This response to comments matrix was prepared to address comments from the United States Environmental Protection Agency (USEPA) dated November 25, 2013 on the Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek (OU-1/OU-2 SERA) dated June 2013 (Revision 1). The responses provided below are focused on revising the OU-1/OU-2 SERA recognizing that many of the USEPA's comments are focused on the Baseline Ecological Risk Assessment that will be prepared for the OU-4 portion of the Site (OU-4 BERA). In responding to the comments, specific reference is made as to whether the OU-1/OU-2 SERA is being revised in response to the comment or whether the comment will be taken into consideration during the development of the OU-4 BERA.

#### Comments: Response: General Comment 1. The presentation of the development of This comment will be considered as part of developing the baseline bioaccumulation factors (BAFs) has improved with corrections to the ecological risk assessment for Operable Unit 4 (OU-4 BERA). The tables in Appendix A and addition of the correlation analysis among USEPA comment regarding the bioaccumulation factor (BAF) for variables. EPA has remaining concern that none of the regressions were emergent insects is being addressed in response to Specific Comment significant. EPA has provided an alternative analysis by using No. 9 and is resulting in a change to the OU-1/OU-2 SERA. normalized data and pairing tissues. The results by EPA's alternative analysis are similar to BAFs provided in the BERA (Table 1). EPA is asking for the alternative BAF approach provided in Attachment 1 to be considered in the OU-4 BERA. The BAF EPA recommends for emergent insects is difference from the value in the SERA. A specific comment is included to address bioaccumulation in emergent insects. General Comment 2. The uncertainty section (Section 6.3.2, The first sentence in Section 6.3.2 has been revised as follows: Bioaccumulation Factors, Page 6-11) should mention that the biological "Because specific biological data were not available for OU-1/OU-2 data used for the bioaccumulation factor development was collected in and, therefore, prey tissue concentrations were not measured in OU-OU-4, and no OU-1/OU-2 specific biological data was available for the 1/OU-2, it was necessary to model prey tissue concentrations using an SERA. uptake model based on biological data collected in OU-4." General Comment 3. Appendix D has characterized the composition of It is P/S's belief that PCB congener 126 (PCB-126) does not present PCBs at the site as essentially devoid of PCB congener 126 based on significant risk concerns for OU-1/OU-2. This finding is based on: limited data for OU-1/OU-2 and without considering the data collected in OU-4 for toxicity testing, where PCB Congener 126 was frequently Lack of consistent detections for PCB-126 in the dataset for detected. A specific comment has been included to address this issue. the Site.

Attachment B provides technical details relating to how the PCB

congener data can be used to refine the characterization of ecological risk. The comment recommends using toxicity reference values derived for the Aroclors that contain the most dioxin-like PCBs, which was the approach taken in the SERA.

PCB-126 was not manufactured at the Anniston facility.

These lines of evidence are further discussed in response to specific comment 15 below.

Specific Comment 1. Section 2.3., Conceptual Site Model, Figure 2-2. Figure 2-2 was revised to depict the surface water pathway as de minimus. In Section 2.3, Page 2-6, the discussion of complete exposure pathways reads, "Because water-based exposure to hydrophobic COPCs, in particular PCBs, is expected to be minimal compared to sediment-based exposure, this pathway is considered a secondary pathway. . ." The text in Section 2.3 describing the role of surface water, sediment, and bioaccumulation in the conceptual site model could be better explained. The discussion should differentiate between direct and indirect exposure. Please consider revising patterning after sample text:

"The particular COPCs at this site are relatively insoluble in water and tend to adhere tightly to sediments. Thus, the bioaccumulation models used in the risk assessment compared concentrations in prey tissues to concentrations in the sediment. Because direct exposure to wildlife to PCBs in surface water is expected to be minimal, compared to exposure through bioaccumulation in the food web, ingestion of surface water is considered a secondary pathway for birds and mammals feeding in Snow Creek. The benthic invertebrate community is directly exposed to COPCs in sediments and surface water. Potential risk to populations and communities of aquatic organisms through direct exposure to surface water is evaluated in Section 3.2 through comparison of available surface water data to National recommended water quality criteria for protection of aquatic life."

Specific Comment 2. Section 3.2, Surface Water Data, Page 3-4. Text indicated that PCB contributions from Snow Creek were negligible. The word "negligible" reflects a value judgment. The concentrations of PCBs in the baseflow samples were above the National recommended water quality criteria half the time. High flow events might transport PCBs in

The third paragraph in Section 2.3 of the OU-1/OU-2 SERA has been revised as follows: "Complete exposure pathways can be further delineated into those expected to have more significant exposure potential (primary exposure pathways), those that are complete but are expected to be minimal compared to the identified primary exposure pathways (secondary exposure pathways), and those expected to be insignificant due to minimal or unappreciable exposure potential (de minimus exposure pathways). For aquatic-feeding receptors, the potential exposure routes are direct contact with the COPC in water or sediment and ingestion of food. The particular COPCs at this site are relatively insoluble in water and tend to adhere tightly to sediments. Thus the bioaccumulation models used in the risk assessment compared concentrations in prey tissues to concentrations in the sediment. Because direct exposure of wildlife to PCBs in surface water is expected to be minimal, compared to exposure through bioaccumulation in the food web, ingestion of surface water is considered a secondary pathway for birds and mammals feeding in Snow Creek. The benthic invertebrate community and communities of aquatic organisms may be directly exposed to COPCs in sediments and/or surface water. Potential risk to populations and communities of aquatic organisms through direct exposure to surface water is evaluated in Section 3.2 through comparison of available surface water data to National recommended water quality criteria for protection of aquatic life."

The 4<sup>th</sup> paragraph in Section 3.2 of the OU-1/OU-2 SERA has been revised as follows:

"Based on data collected during the RCRA program, the high flow data are short-term in nature and not appropriate for evaluating long-term

Snow Creek. Uncontrolled migration of PCBs from the site might be unacceptable, if this were occurring. Text should simply state that PCB transport under high flow conditions is much greater than during baseflow.

Specific Comment 3. Section 5.2, PCB Sediment Benchmarks, Page 5-1. The section title and some of the text was not changed to reflect the site-specific, risk-based concentration (SSRBC) terminology. Table 5-1 was not changed for the new terminology.

exposures to creek water. The surface water data also indicate that during base-flow conditions, PCB contributions from Snow Creek are low and PCB transport under high flow conditions is greater than during base-flow conditions."

The heading level for Section 5.2 of the OU-1/OU-2 SERA has been revised to be a sub-heading of Section 5.1 and is now 5.1.1. The heading title for this section has been revised to: "Sediment PCB Site-Specific Toxicity Values" ". This terminology was also added to Table 5-1.

See response to specific comment 4 for the text changes to this section.

Specific Comment 4. Section 5.2, PCB Sediment Benchmarks, Page 5-3. Text at the bottom of Page 5-3 indicated that the EC20\* was chosen as the low toxicity threshold due to the variability in the responses among the two cycles of testing and due to the test acceptability criteria for control mortality. This is a value judgment. Therefore, EPA has requested that the SSRBCs be developed for the threshold, 10, and 20 percent impairment relative to the reference envelope. The text should not say the EC20\* "was chosen" because it is EPA's role to choose the cleanup level.

The following text replaces the text after the 8<sup>th</sup> paragraph in Section 5.1.1 of the OU-1/OU-2 SERA:

"Toxicity values were developed for the ECO\*, EC10\* and EC20\* values. The ultimate selection of sediment cleanup levels by the USEPA may in part be based on this range of effect levels and might consider the variability in the responses among the two cycles of testing and the test acceptability criteria for control mortality."

The OU-1/OU-2 SERA was also revised to reflect that the ECO\* for *H. azteca* of 1.38 mg/kg dw was selected as the low SSRBC for PCBs, and the *H. azteca* EC2O\* of 4.43 mg/kg dw was selected as the high SSRBC for PCBs.

While the OU-1/OU-2 SERA was not revised to include the following text, P/S believe the points made below should be considered in the EPA's selection of a sediment cleanup value for Snow Creek sediment. Specifically, the variability in responses among the three lab-control sediments (using the same sediment) between the two cycles of testing was frequently greater than 20%. Additionally, according to USEPA (2000), the test acceptability criteria for *H. azteca* are a minimum mean control survival of 80% and a measurable growth of

test organisms in the control sediment, and for C. tentans (a chironomid closely related to C. dilutus) are a minimum mean control survival of 70% and a minimum mean weight per surviving control organism of 0.48 mg ash free dry weight. Therefore, extrapolating from variability in survival to variability in all endpoints (recognizing that variability in growth and reproduction endpoints is generally higher than variability in survival endpoints), it is reasonable to consider that less than or equal to a 20% apparent adverse effect relative to the "bottom" of the reference envelope (i.e., any PCB concentration less than or equal to the EC20\* value) is within the range of normal control variability and therefore has a moderately high probability of being a false-positive result, leading to minimal concern about such toxicity results. Even if a given effects concentration between the ECO\* and EC2O\* were real instead of just a result of random variability, the USEPA's (2000) implicit acceptance of up to at least 20% mortality as a *de minimus* risk supports consideration of the EC20\* as a low toxicity threshold."

The following text was also included at the end of Section 5.1.1 of the OU-1/OU-2 SERA. "The most sensitive endpoints for *H. azteca* related to reproduction (the lowest ECO\*, EC10\*, and EC20\* values [i.e., 0, 10, and 20%-impairment beyond the "bottom" of the reference envelope]) were 1.38 (the ECO\*), 2.58 (the EC10\*), and 4.43 (the EC20\*) mg tPCB<sub>A</sub>/kg dw of sediment for 42-d young/female normalized to 42-d survival (Appendix B, Table B-1). The most sensitive endpoints for C. dilutus were related to emergence (the lowest ECO\*, EC10\*, and EC20\* values were 2.04 [the EC0\*], 6.80 [the EC10\*], and 14.3 [the EC20\*] mg tPCB<sub>A</sub>/kg dw of sediment, for percent emergence of the pupae from their cocoons; Appendix B, Table B-1). The adult biomass endpoint for *C. dilutus* that was reported by the laboratories is not included as it was based on estimated instead of measured weights of adult *C. dilutus*, thus making that endpoint highly uncertain. Based on this analysis, a range of toxicity values are considered. Specifically, the ECO\* (1.38 mg/kg) and EC2O\* (4.43 mg/kg) toxicity

Specific Comment 5. Section 5.2, PCB Sediment Benchmarks, Page 5-4. Also, on Page 5-4 at the end of this section, the text recommends the second highest EC20\* for C. dilutes emergence as the high end benchmark. The second highest EC20\* is less conservative because it is for a different organism. The remedy should be protective of most species of organisms. Since only two species were tested, the results for the most sensitive species should be used to develop the range of preliminary remedial goals based on the threshold, 10, and 20 percent impairment values. A range should be presented. Text presenting a particular value within the range as the choice of the SSRBC should be removed.

values for the most sensitive endpoint and species from the site-specific toxicity testing are compared to Site PCB data in Section 6."

See text changes in the response to specific comment 4 above that addresses this comment.

Tables 5-1, 6-3, and 6-4 of the OU-1/OU-2 SERA were changed to reflect this change of the SSRBC range. The description of SSRBC exceedances in Section 6.1.3 and the findings in Section 6.4 were also updated accordingly. In addition, text in appendix B was updated to be consistent with changes reflected in responses to specific comments 4 through 6.

*Specific Comment 6. Section 5.2.* Toxicity of site sediments should be compared to the reference condition.

A matrix table showing which OU-4 sediments selected for the testing program exceeded the reference envelope response for each endpoint of each species has been inserted into Appendix B of the OU-1/OU-2 SERA.

The following text has also been added to the 2<sup>nd</sup> paragraph in Section 5.1.1 (formerly 5.2) to clarify that "The purpose of the toxicity tests was to develop concentration-response relationships for the various *H. azteca* and *C. dilutus* endpoints, not to determine which specific sediments across the Site (including OU-1/OU-2 and/or OU-4) were toxic. The sediments selected for the toxicity testing program were not randomly chosen, but instead, were collected from a few targeted locations to provide a wide range of combinations of PCB and OC concentrations were tested. For those reasons, it is not appropriate to compare the test sediments to the reference condition, but the toxicity test results will be used as intended to identify a range of concentration-based toxicity thresholds."

Additional information regarding the selection of the reference sites is provided in the response to Specific Comment 8.

Specific Comment 7. Section 6.1.3, SSRBC Comparisons, Page 6-4. The EC20\* for C. dilutes emergence is described as the LOAEL for benthic invertebrates, which it is actually not the case. Both the EC20\* for amphipods and the EC20\* for midges are LOAELs. They are LOAEL values for different species. The EC20\* for C. dilutes does not account for exposure to the more sensitive benthic invertebrate species. The NOAEL to LOAEL range in Table 6-4 should be the threshold to EC20\* values for the amphipod endpoint, i.e., the EC0\* and EC20\* values of 1.38 and 4.43 mg/kg. Text at the top of Page 6-4, which indicated that the LOAEL SSRBC for benthic invertebrates was not exceeded, should be revised.

Specific Comment 8. Section 6.3.3.1. ARCADIS selected the candidate reference sediments for the study after having evaluated the locations and concluding that the sediments were appropriate. Why are these sediments now in question? The language that calls into question the reference locations proposed by ARCADIS and the data associated with them needs to be eliminated from this document.

The first two sentences of the third paragraph in Section 6.1.3 of the OU-1/OU-2 SERA have been revised as follow to be consistent with the revised range of toxicity values (i.e., the ECO\* for *H. azteca* of 1.38 mg/kg dw and the *H. azteca* EC2O\* of 4.43 mg/kg dw that are described in the response to Specific Comment 4 above):

"For benthic invertebrates, the 95% UCL concentration for PCBs exceeded the ECO\* and the EC20\* for the most sensitive endpoint and species tested in the site specific toxicity tests (i.e., *H. Azteca* 42-d young/female normalized to 42-d survival), with 47 and 74 percent of samples exceeding these values respectively."

It seems appropriate to include some discussion in this uncertainty section regarding the nature of these reference sediment samples that were collected in areas upstream of the Site and were by design, void of any background contamination associated with the Snow Creek drainage basin that may be associated with the test samples that were collected for the toxicity testing program.

The reference sites were selected using criteria specified by the USEPA during the development of the Phase 2 Field Sampling Plan for OU-4 (OU-4 Phase 2 FSP). Although the reference location habitats were generally comparable to locations in OU-4, minus the influence of urban drainage, the reference sites were selected to be void of all contamination. This included a phased analytical program during which samples were first analyzed to ensure that PCBs were not detected. After these initial analyses confirmed that PCBs were not present in these candidate reference areas, samples were analyzed for an expanded list of chemical constituents. The results of those analyses were communicated to the USEPA, and locations with the lowest concentrations of chemical constituents were selected as reference sites with the USEPA's concurrence. Although sediments from these reference sites were used during the sediment toxicity testing program, they were used with a goal of developing a PCB concentration-response relationship and do not represent conditions

in OU-4 minus any impacts that may be attributable to P/S. No change made to text. The text referenced is in the uncertainty section and as such describes the uncertainty associated with the reference sediments.

The initial two paragraphs of Section 6.3.3.1 have been revised as follows..." Uncertainty in the sediment-toxicity benchmarks (ECO\*, EC10\*, EC20\*, and EC50\* values) has five components: (1) whether the reference sediments collected in areas that are located upstream of the Site reflect background chemical constituents that are not associated with P/S (i.e., urban runoff from the Snow Creek watershed); (2) whether the lowest measured reference-sediment response for a given toxicity endpoint adequately represents the lowest response that would be caused by a reference sediment; (3) variability in the calculated ECO\*, EC10\*, EC20\*, and EC50\* values; (4) inherent variability in results of toxicity tests; and (5) potential variability between batches of toxicity tests conducted at different times and in different laboratories a considerable length of time after the sediments were collected from OU-4. These five potential sources of uncertainty are discussed below.

Regarding the first uncertainty, the six reference sediments collected from Choccolocco Creek approximately 3 kilometers upstream of its confluence with Snow Creek came from an agricultural area that does not receive urban inputs. Therefore, the reference sediments do not have physical-chemical characteristics of an urban-influenced stream (Snow Creek) and might underestimate the toxicity caused by chemicals that originated from non-Site sources, thus, overestimating the toxicity caused by inputs originating from the Site."

Specific Comment 9. Appendix A, Section 2.2.2. Emergent Insects, Page 5. The text acknowledges that the observed bioaccumulation into crane flies from two Upper Choccolocco Creek stations was much higher than observed for damselflies (Figure A-12) or from a sample of crane flies mixed with miscellaneous winged insects collected from EMA-02. EPA

It is agreed that a median value may not be appropriate for estimating a central tendency when the data are from two separate populations. As such, for the OU-1/2 SERA, an alternative approach of averaging results from the two populations of data was employed. The text in Section 2.2.2 of Appendix A to the OU-1/OU-2 SERA was replaced with

agrees that averaging across both species reflects a possible diet. However, the average BAF in Table A-6 was 3.67. The SERA risk calculations used the median BAF of 0.66, which was much lower and reflected only the damselfly data in Figure A-12. The green line on Figure A-12 passes through the data points for the damselfly data and does not fit the description of averaging across both species, which would have been the case if the green line passed between the groups of data. The median BAF is calculated correctly, but a median value only works when the data is from the same population. EPA recommends evaluating the BAFs for crane flies and damselflies separately and averaging the results to reflect a diet that contains both insects.

the following: "Emergent insects that were collected consisted primarily of crane flies (Tipulidae), damselflies (Odonata), and dragonflies (Odonata). Three composite samples were collected from each of the nine BSAs for a total of 27 samples from OU-4. Nine of the 27 composite samples contained crane flies as well as other species. Six of the composites, all of which were taken with in EUA 02 and EUA 03, contained crane flies only and these samples had PCB concentrations that were substantially higher (5.8 to 7.8 mg/kg dw) than concentrations in the mixed samples, which ranged from 0.1 mg/kg dw to 0.8 mg/kg dw. Because the samples that contained mixtures of species, which included crane flies, did not contain higher PCB concentrations than samples containing only dragon or damsel flies, there appears to be substantial uncertainty associated with the exposure of crane flies. This uncertainty is discussed in Section 6.3.2 of the OU-1/OU-2 SERA. Because the crane fly only PCB data appear to be a separate population from the mixed species data, the approach for calculating emergent insect BAFs is modified from the approach used for other tissue types as described below.

As was done for the other tissue types, the arithmetic mean of composites within each BSA was taken and associated with the arithmetic mean of the sediment sample concentrations for that BSA for the analysis for a total of nine discrete tissue and sediment concentration estimates. For PCBs, the regression analyses were conducted for mixed species samples only as the sample size for crane fly only samples (n=2) was too small to conduct a regression. The regression analyses for mixed species PCBs and all samples for mercury did not result in a predictive relationship between sediment and emergent insect tissue on a dry weight or on an OC and lipid normalized (PCB only) basis (Figures A-12 and A-13, respectively). Similarly, the additional correlation analysis (Tables A-21 through A-24) did not indicate a predictive relationship between sediment on a percent fines normalized basis or emergent insect tissue on a wet weight basis. Based on this analysis and the lack of a predictive

relationship between sediment and tissue, it was necessary to calculate BAFs. Because of the different populations of data for PCBs, a median BAF is not recommended. Alternatively, a mean BAF for the mixed samples was calculated separately from the mean BAF for crane flies only. The "mixed diet" BAF was calculated as a weighted average with 22 percent (i.e., the percent of samples collected that were comprised of only crane flies) of the BAF being represented by crane flies only and the remaining 78 percent represented by mixed species. This is considered a conservative proportion based on the survey data collected in 2006 and 2007 and reported in the Operable Unit 4 Ecological Survey Report (ARCADIS BBL 2007). These survey results showed that of the 60 survey sample locations, crane flies were found in only four locations (7%) compared to odonates, which were found in 30 locations (50%). The resulting weighted mean BAF is 3.8 and is shown relative to the tissue data on Figure A-30. The selected BAF for mercury is the median value of the BSAs."

Tables 4-1 (BAF summary), 6-1 (Avian SSRBC calculations), 6-2 (mammalian SSRBC calculations), 6-3 (SSRBC summary), and 6-4 (Summary of SSRBC exceedances) from the OU-1/OU-2 SERA were updated accordingly. In addition, the results described for avian and mammalian receptors in Section 6.1.3 and 6.4 were updated accordingly with the revised results for receptors that consume emergent insects.

The following text was also added to the Uncertainty discussion and will replace the 5<sup>th</sup> paragraph in Section 6.3.2 of the OU-1/OU-2 SERA. "To better understand this uncertainty and the disparity between concentrations, natural history of the orders collected was reviewed. There are thousands of species of crane flies, dragonflies and damselflies, but in general, crane flies primarily feed on vegetation and algal and microscopic organisms low in the food chain. They can also feed and reside in both aquatic and terrestrial environments. This is in contrast to odonates, which are mainly predaceous and prey upon

various trophic levels within the food chain throughout their nymph development stage and on insects in their adult stage. This information is not consistent with the observed concentrations, as species feeding lower in the foodchain (e.g., on plant matter) would not be expected to be exposed to higher PCB concentrations than species that are predators. Because some species of crane flies can be terrestrial, a possible connection between the crane flies and the riparian soil adjacent to EUA-02 and EUA-03 was considered. Calculating a mean soil concentration and comparing that to the tissue concentrations in these areas results in BAFs that are more consistent with what was observed in other samples, but the BAFs are still relatively high (e.g., 1.4 and 1.8 for crane flies only compared to 0.3 to 0.8 for mixed species). Based on the feeding strategy for crane flies, it seems unlikely that the sediment in EUA-02 and EUA-03 is the source of the elevated PCB concentrations measured. Comparing the crane fly results to those observed at another PCB River site (i.e., the Kalamazoo River), indicates that the BAFs for dipteran species are very consistent with the BAFs observed for mixed species in this OU-1/OU-2 SERA (e.g., on a wet weight basis, mean OU-4 BAF = 0.17 and mean Kalamazoo BAF for all emergent insects = 0.18). This further supports that the six crane fly samples collected within EUA-02 and EUA-03 may not be appropriately representative of aquatic emergent insects. However, the selected BAF is intended to represent uptake across a range of insects and it is recognized that upper trophic level receptors do not differentiate between aquatic and terrestrial insects when feeding. Given that the crane fly PCB data are uncertain, the selected BAF may over- or underestimate potential uptake for these species."

While the averaging approach outlined above has been incorporated in the OU-1/OU-2 SERA, the underlying uncertainties associated with this approach will be considered further and the approach may be modified for the OU-4 BERA.

Specific Comment 10. Appendix A, Table A-2. PCBs were not detected in frogs from the reference stations. Please correct Table A-2 to show the

The toad was collected from the floodplain and adult toads are generally considered terrestrial species, therefore this single sample

[froq] PCB concentrations at ERA-02 in red text. PCBs were detected in was not included with the aquatic tissue results summarized in Table an American toad from ERA-03 but were not detected in frogs. Table A-A-2. Table A-2 has been updated to show ERA-02 frog non-detect 2 does not use the toad data. Toads were only collected at ERA-03. data as red text. Please resolve whether the toad data should be ued. Specific Comment 11. Table A-21, Correlation Analysis. Please check the The correlation coefficients in Table A-21 have been rechecked and table. Some of the correlation coefficients I was unable to reproduce. verified. No changes have been made to Appendix A of the OU-1/OU-2 SERA. There is a possibility that the USEPA may be working with a slightly different dataset and as the forthcoming OU-4 BERA is prepared, it will be important to confirm that the USEPA has the same dataset as P/S. Specific Comment 12. Appendix A. An alternative approach to This comment will be considered as part of developing the OU-4 BERA. developing BAFs is to seek the relationships offering the most correlation by excluding an outlier, using normalized data for biota and sediment, using lipid-normalized tissue data with non-normalized sediment data, or by regressing the concentration in one type of biota by its presumed food source. For example, if Sample ELA-02 is removed from the lipid-normalized bioaccumulation of PCBs in aquatic plants, the correlation coefficient jumps to 0.77. The question is whether it is better to find a significant regression to estimate the BAF and use the average lipid content in aquatic plants to convert the BAF into the nonnormalized value. The similarity in the results between the approach of using the median of BAFs and the graphical approach is encouraging. The median approach to developing BAFs may slightly underestimate the BAF by not weighing as heavily the few samples with higher observed bioaccumulation compared to the regression approach. This data weighing effect was especially pronounced in the case of the BAF for the emergent insects. The median BAF approach is not recommended for the emergent insects and is discussed in another comment. Alternative approaches to estimating the BAFs with regression equations are provided in Attachment A. Specific Comment 13. Appendix B. Page 8. Delete statement that The statement regarding MacDonald et al. and the conclusions MacDonald et. al. is not appropriate. Take out conclusions about regarding the appropriate range have been removed from the OUappropriate range. It is appropriate to state strengths and weaknesses 1/OU-2 SERA. of each method but not to make conclusion.

Specific Comment 14. Appendix D. Page D-12, last sentence. Re-write to remove statement that risk is negligible. EPA agrees that no further ecological assessment is required.

Specific Comment 15. Appendix D. Page D-14, Bullet 6, indicated that PCB congener 126 was detected in two out of 27 samples. However, PCB-126 was detected with greater frequency in the samples used for the OU-4 toxicity testing, which targeted sediments with higher PCB concentrations. PCB-126 should not be assumed negligible or absent. The SSRBCs for dioxin/furans in Appendix D are correct and are appropriate to use for dioxins/furans. Text should be revised to qualify statement about presence of PCB-126 in OU-1/OU-2 sediments. Please see supporting information in Attachment B.

The statement was removed as requested.

It is P/S belief that PCB congener 126 (PCB-126) does not present significant risk concerns for OU-1/OU-2. This finding is based on:

- Lack of consistent detections of PCB-126 in the dataset for the Site.
- PCB-126 was not manufactured at the Anniston facility.

These two lines of evidence are further discussed below, and the following text was included in Appendix D of the OU-1/OU-2 SERA.

"The limited detection of PCB -126 is also supported by the floodplain soil data collected in OU-1/OU-2 and OU-4. PCB-126 was only detected in 12% of the floodplain soil samples (25 of 212) collected from these two OUs and analyzed for this particular congener. The analytical results for PCB-126 in the sediment samples are similar with this congener only being detected in 15% (5 of 33) of the samples collected from these two OUs. In considering the effect of the other PCB congeners that comprise the list of dioxin like PCB congeners, the potential presence of congeners PCB-77, PCB-81 and PCB-169 is often considered. In addition to PCB-126, these other non-ortho substituted PCB congeners have the largest effect on the calculated risk levels.

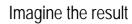
The frequency of detection for these three congeners for the OU-1/OU-2 and OU-4 dataset includes PCB-77 at 9%, PCB-81 at 8% and PCB-169 at 1%. These detection frequency percentages are based on all of the sample results inclusive of parent and duplicate samples. This approach was necessary as the PCB congeners were sometimes not detected in both the parent

and duplicate samples. The collective frequency of detection for sediment in these two OUs includes PCB-77 at 15%, PCB-81 at 15% and PCB-169 at 0%. While the frequency of detection of PCB-126 is higher (42%) in the 29 analyses that were conducted for sediments collected for the sediment toxicity and bioaccumulation testing program, these analyses were conducted on samples that are not representative of Site conditions and will not be used for defining the nature and extent of contamination in the yet to be developed OU-4 Preliminary Site Characterization Summary Report and the OU-4 Remedial Investigation Report. These sediment samples were initially sieved in the field, re-handled and re-stored several times at the sediment toxicity testing laboratory over a nine month period and the same parent samples were often remixed and reanalyzed. It is noteworthy that PCB-126 was only detected when the total PCB concentrations were elevated. Of the 11 of 26 samples where PCB-126 was detected, nine of the samples had total PCB concentrations greater than 25 mg/kg and two of samples had total PCB concentrations between 5 and 10 mg/kg. In any of these cases, the total PCB concentration would be the risk driver and the potential presence of PCB-126 would not be a significant consideration. Concentrations of the other non-ortho substituted PCB congeners (PCB-77, PCB-81 and PCB-169) were also not detected in any of the sediment samples collected for the sediment toxicity and bioaccumulation testing program.

The limited presence of PCB-126 in the Anniston area is also supported by research published in the mid-1990s (Frame et al. 1996). This research indicates that PCB congener PCB-126 was only detected in measurable concentrations in what is referred to as "late Aroclor 1254". This particular mixture only was manufactured from 1974 to 1977 and based on the PCB

production dates for the Anniston facility, was not produced in Anniston.

The lines of evidence presented above support the finding that PCB-126 is not a significant risk contributor for OU-1/OU-2 or OU-4. This finding is consistent with the human health risk assessments that were prepared for OU-1/OU-2 and OU-4 by the USEPA (CDM, 2010b and JM Waller and Associates, Inc. 2013)."





Pharmacia LLC and Solutia Inc.

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek

Anniston PCB Site, Anniston, Alabama

December 2013 Revision 2



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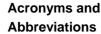


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ACDNR Alabama Department of Conservation and Natural Resources

AE assessment endpoint

AHR Arylhydrocarbon Receptor

ASTM ASTM International

BBL Blasland, Bouck & Lee, Inc

BAF bioaccumulation factor

BERA Baseline Ecological Risk Assessment

BSA biological sampling area

BSAFs biota-sediment accumulation factors

BW body weight

CD Consent Decree

COPC constituent of potential concern

CSM conceptual site model

d day

DLC dioxin-like compounds

DL-PCBs dioxin-like polychlorinated biphenyls

DMI dry matter ingestion

dw dry weight

EcoSSL Ecological Soil Screening Level

EDR ecologically distinct reaches

EPC exposure point concentration

ERA ecological risk assessment

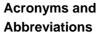
FIR food ingestion rate

FS Feasibility Study

g gram

HQ hazard quotient

KDWP Kansas Department of Wildlife and Parks





KPM Kansas Parks Method

kg kilogram

LOAEL lowest observed adverse effect level

ME measurement endpoint

MENVIQ Environment Canada and Ministere de l'Environment du

Quebec

mg/kg milligrams per kilogram

mg/kg BW-d milligrams/kilogram body weight per day

NOAEL no observed adverse effect level

OC organic carbon

OU Operable Unit

p probability of a type 1 error

PAH polycyclic aromatic hydrocarbons

PCB polychlorinated biphenyl

PCD partial consent decree

PCDD polychlorinated dibenzo-p-dioxin

PCDF polychlorinated dibenzofuran

PEC probable effects concentration

PEL probable effects level

P/S Pharmacia LLC and Solutia Inc.

PSCS Preliminary Site Characterization Summary

PSCSR Preliminary Site Characterization Summary Report

RBP Rapid Bioassessment Protocol

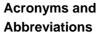
RCRA Resource Conservation and Recovery Act

RI Remedial Investigation

RQ risk question

SERA Streamlined Ecological Risk Assessment

SLERA Screening-Level Ecological Risk Assessment





SQG Sediment Quality Guideline

SSRBC site-specific risk-based concentration

SVOCs semivolatile organic compounds

tPCB total polychlorinated biphenyls

tPCB<sub>A</sub> total polychlorinated bipenyls measured as Aroclors

tPCB<sub>H</sub> total polychlorinated bipenyls measured as homologs

TCL target compound list

TEC threshold effect concentration

TEFs toxic equivalency factors

TEL threshold effects level

TEQ toxic equivalency

TOC total organic carbon

TRV toxicity reference value

TSS total suspended solids

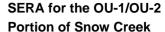
TWRA Tennessee Wildlife Resources Agency

USEPA U.S. Environmental Protection Agency

VOCs volatile organic compounds

UCL 95% upper confidence limit

μg/L micrograms per liter





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#### 1. Introduction

The Anniston Polychlorinated Biphenyl (PCB) Site (the Site) is located in portions of Calhoun and Talladega counties in the north-central part of Alabama, near the City of Anniston. The Site has been investigated for the past 20 years based on the presence of PCBs and other chemical constituents that might occur in various Site media. Geographically extensive, the Site encompasses the Solutia Inc. (formerly Monsanto) Anniston Plant (the plant) and grounds, residential and non-residential properties, and stretches of both Choccolocco Creek and Snow Creek and their floodplains. The Anniston PCB Site is not on the Superfund National Priorities List, but is being addressed through the Superfund Alternative Approach. Because it is large and varied, it was divided into four operable units (OUs) to facilitate parallel evaluation efforts in the different areas and to streamline closure in specific locations, as appropriate (Figure 1-1). The OU-1/OU-2 Area generally consists of both residential and non-residential properties within the Site upstream of Highway 78, up to and surrounding the On-Facility Area (OU-3). OU-4 includes Choccolocco Creek and its floodplain downstream to Lake Logan Martin, the lower end of Snow Creek and its floodplain downstream of Highway 78 to the confluence of Snow and Choccolocco Creeks, and the backwater area of Choccolocco Creek upstream of the Snow Creek confluence. A decision on what investigations may be required beyond Choccolocco Creek will be made after data from the OU-4 Remedial Investigation (RI), and any other studies that may become available, are reviewed (Blasland, Bouck & Lee, Inc [BBL] 2004). This Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek (SERA) evaluates the OU-1/OU-2 portion of Snow Creek, which generally includes the area of the Snow Creek drainage upstream of U.S. Highway 78, up to the confluence with the 11<sup>th</sup> Street Drainage Ditch.

The OU-1/OU-2 portion of Snow Creek comprises highly developed and disturbed land uses. Residential, light industrial, commercial, and industrial activities occupy the majority of land in this area. In many cases, the disturbance runs well into the riparian corridor and even reaches the creek bank. The clear differences between the highly urbanized environment of Snow Creek in OU-1/OU-2 and the more natural, less disturbed lower reaches of the creek was part of the rationale for locating the dividing line between OU-1/OU-2 and OU-4 at Highway 78.

Potential ecological risks for OU-1/OU-2 were initially evaluated in the *Screening Level Ecological Risk Assessment for Operable Units 1, 2, and 3* (SLERA; BBL 2005). The U.S. Environmental Protection Agency (USEPA) approved the SLERA with the exception of the OU-1/OU-2 portion of Snow Creek. The approval acknowledged the



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low quality and fragmented nature of terrestrial habitat in OU-1/OU-2 and the need to more quantitatively evaluate ecological risks in Snow Creek. The plan moving forward from this approval was to include the OU-1/OU-2 portion of Snow Creek in the baseline ecological risk assessment (BERA) for OU-4. Based on the large amount of technical information that has been developed for the OU-4 BERA, and the planned near-term schedule for completing the remedial investigation and feasibility study (RI/FS) for OU-1/OU-2, Pharmacia LLC and Solutia Inc. (together Pharmacia LLC and Solutia Inc. are referred to as P/S) requested that the ecological risk assessment (ERA) for the OU-1/OU-2 portion of Snow Creek (the OU-1/OU-2 site area) proceed in advance of the OU-4 BERA. This request was presented in a letter dated November 14, 2012 (Solutia Inc. 2012) and was approved by USEPA in a letter dated November 16, 2012 (USEPA 2012). The concept for ERA of the OU-1/OU-2 portions of Upper Snow Creek was that a streamlined ecological assessment would be appropriate, acknowledging that, in application, the highly disturbed nature of Upper Snow Creek rendered habitat, human activity, water quality, and general disturbance as critical constraints. This SERA is being submitted concurrently with the RI Report for OU-1/OU-2 (ENVIRON 2013). This SERA fulfills the commitment made by P/S, who are signatory parties to the August 4, 2003 Partial Consent Decree (CD) for the Site (USEPA 2002), to provide an RI Report that summarizes the risk assessments for OU-1/OU-2, among other requirements.

This SERA is focused on key ecological receptors that may reside or forage within the aquatic habitat in the OU-1/OU-2 portion of Snow Creek (Figure 1-2). As noted above, the USEPA previously approved the terrestrial component of a SLERA for OU-1/OU-2 (BBL 2005), which found that terrestrial exposure pathways in OU-1/OU-2 are limited by poor habitat quality. The SLERA indicated that the habitat in this portion of Snow Creek is dominated by mowed and maintained lands with little habitat quality, impervious surfaces, and transportation infrastructure, and development pressure is strong, which will likely lead to even more fragmented and disturbed ecological habitat with the passage of time. Thus exposure to terrestrial receptors and potential risk is expected to be within an acceptable level and is not quantitatively evaluated in this SERA.

### 1.1 OU-1/OU-2 Streamlined Risk Assessment Process

The purpose of this SERA is to evaluate the likelihood that adverse ecological effects are occurring or may occur for local receptor populations as a result of exposure to constituents of potential concern (COPC) in the OU-1/OU-2 portion of Snow Creek. As described in the SLERA (BBL 2005) and the Preliminary Site Characterization Summary Document (PSCS; ARCADIS 2009), exposure pathways to terrestrial



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receptors in this area are limited by the low quality fragmented terrestrial habitat. Thus, this SERA does not evaluate the floodplain or terrestrial areas of the OU-1/OU-2 portion of Snow Creek, and focuses on receptors that may be exposed to the aquatic (instream) portion of Snow Creek. Because of the similarly fragmented/degraded nature of the aquatic habitat within the OU-1/OU-2 portion of Snow Creek, the potential for ecological risks in this OU are most appropriately evaluated through a streamlined assessment. The specific ways in which this assessment is streamlined are described in more detail in Section 2.

This SERA follows the process outlined in the USEPA Superfund Guidance for Ecological Risk Assessment (USEPA 1997). The SLERA (BBL 2005) that was completed for OU-1/OU-2 in 2007 includes Steps 1 and 2 in the USEPA's eight-step process (e.g., Step 1 - Screening Level Problem Formulation and Effects Evaluation and Step 2 – Preliminary Exposure Estimates and Risk Calculations). This SERA begins with Step 3 - Baseline Problem Formulation. The problem formulation (described in Section 2) includes the refinement of the OU-1/OU-2-specific aquatic ecological conceptual site model (CSM), and identification of assessment endpoints (AEs), measurement endpoints (MEs), and representative receptors that will be evaluated. The Data Quality Objective portion of Step 4 (Study Design and Data Quality Objective Process) is addressed in Section 3. Study Design (Step 4) and field verification of sampling design (Step 5) were not conducted for this SERA because additional sampling was not required. Exposure and Effects Assessments (Step 6) to estimate potential exposure to the identified representative receptors and to identify appropriate toxicity and/or effects data are included in Sections 4 and 5, respectively. Finally, the Risk Characterization (Step 7) combines the exposure and effects components to calculate site-specific risk-based concentrations (SSRBCs) for each of the receptors evaluated. These SSRBCs are compared to the available sediment data for OU-1/OU-2 to evaluate possible risk. The risk characterization also includes a detailed description of habitat in OU-1/OU-2 and an uncertainty analysis. Following these elements, a risk summary is provided based on the complete interpretation of all lines of evidence.

#### 1.2 Document Organization

The remainder of this OU-1/OU-2 SERA includes the following sections:

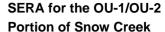
- Section 2 Problem Formulation
- Section 3 Data Evaluation



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- Section 4 Exposure Assessment
- Section 5 Effects Assessment
- Section 6 Risk Characterization
- Section 7 References

Specific details regarding development of bioaccumulation factors (BAFs) used in the exposure assessment (Section 4) are included in Appendix A. Additional supporting information for the effects assessment (Section 5) on the development of Site-specific PCB sediment benchmarks and selection of toxicity benchmarks and toxicity reference values (TRVs) for PCBs and other COPCs is provided in Appendices B and C, respectively. The methods and exposure/effects inputs for the assessment of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs/PCDFs) and dioxin-like PCBs (DL-PCBs) are provided in Appendix D.





#### 2. Problem Formulation

Problem formulation defines the goals and establishes the scope and focus of an ecological risk assessment. The problem formulation for this SERA includes an overview of the ecological setting, selection of COPCs, the aquatic ecological CSM, the selection of AEs and MEs, and the identification of representative receptors. Each of these elements is discussed below.

## 2.1 Ecological Setting

The ecological setting of the non-residential, residential, and industrial properties in OU-1/OU-2 has been investigated by risk assessors and ecologists on four occasions: October of 2001, May of 2002, October of 2003, and June of 2005. The 2001, 2002, and 2003 work was used to inform the detailed quantitative and qualitative survey work that was conducted in 2005 to support the SLERA (BBL 2005). The methods and results of the 2005 survey are summarized in this SERA, along with details of the area from previous work.

### 2.1.1 Land Use Classifications

Several classifications of land use in OU-1/OU-2 were surveyed as potential habitat for wildlife. The findings, taken from the SLERA (BBL 2005), are described below.

Residential. Most of the habitat available to ecological species in these areas is limited to maintained lawns with sparse and arranged ornamental (and often exotic/"non-native") trees and shrubs. Impervious layers, as represented by paved driveways, rooftops, streets, or large parking areas, are present throughout the residential communities and provide little, if any, significant habitat. Mowed lawns of some residential properties are maintained right up to the edge of Snow Creek. In these cases, there is little habitat in the form of cover or forage for terrestrial wildlife. In other locations where residential properties do not border the creek, riparian habitat along the top of the creek bank (although typically narrow) provides some habitat for species of songbirds and "urban" wildlife (e.g., raccoons). However, these areas are somewhat isolated by surrounding dense, residential communities (and other land uses), and therefore access is likely constrained.

Habitats associated with residential communities are most dominant in sections of OU-1/OU-2 immediately north and south of Route 202 and to the west of Route 21 in



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Anniston (Figure 2-1). Several other residential communities are present along the west side of Noble Street and on Main Street in Oxford.

**Industrial.** Land use in industrial areas is dominated by the presence of commercial buildings, manufacturing facilities, junkyards, parking areas, railroad tracks, and areas with impervious cover (usually greater than 80%), or if not impervious, groundcover disturbed by maintenance, excavation, or debris. Potential habitats are primarily disturbed or abandoned fields, patches of urban scrub/shrub forest, or maintained lawns with sparse ornamental trees and shrubs. Little or no wildlife were observed at locations throughout industrial areas during surveys.

**Commercial.** Land use in commercial areas is dominated by retail structures, single stores, strip malls, associated parking areas, landscaping, stormwater facilities, and areas with an impervious cover (usually greater than 80%). Potential habitats consist of maintained lawns, and sparse ornamental trees and shrubs. Little or no wildlife were observed in these areas.

**Recreational/School.** Land use in these areas is dominated by playgrounds, ball fields, and large areas of maintained and manicured lawns (nearly 100% cover). Functional ecological habitats are confined to less regularly maintained fields where songbirds typical of urban environments were observed foraging.

**Transportation Infrastructure**. Non-residential areas (primarily associated with transportation infrastructure, including roadways and railroad beds) are found throughout OU-1/OU-2. Main roads and the active railway through Anniston are used heavily by motorists and trains, respectively. In fact, it is this high density transportation infrastructure that limits the abundance and quality of terrestrial habitat by creating small, isolated patches of field or forested habitat.

## 2.1.2 Terrestrial Habitat Summary

Both residential and non-residential land uses have altered the floodplain of Snow Creek. Over time, there have been many alterations to the creek itself, and significant development of residential and non-residential properties within the floodplain have altered topography and floodplain boundaries. The extensive developed land areas have consumed much of the contiguous habitat that was in place before the development of Anniston and Oxford. What are left are only small, isolated patches of disturbed land that have limited capacity to support wildlife communities. Many of the terrestrial habitats provided by trees and shrubs (including a high proportion of non-



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native species) are confined to the steep altered edge of Snow Creek. Here, habitats are provided by mimosa (*Albizia julibrissin*), sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), slippery elm (*Ulmus fulva*), privet (*Ligustrum vulgare*), white aster (*Aster vimineus*), and evening primrose (*Oenothera biennis*). These habitats are disturbed by pruning. Other locations where trees and shrubs are present are in small, undeveloped areas that border residential, commercial, or industrial properties near the railroad tracks that run adjacent to and across Snow Creek (Figure 2-1). Major species in these habitats include mimosa, multiflora rose (*Rosa multiflora*), tree-of-heaven (*Ailanthus altissima*), and kudzu (*Pueraria montana*). These are invasive forms that have colonized the disturbed habitats in this area. Additional quantitative terrestrial habitat survey work was conducted in 2005 and is summarized below.

### 2.1.3 Quantitative Terrestrial and Aquatic Habitat Survey Summary

In addition to these observations, the 2005 survey included two quantitative approaches for evaluating the habitat quality in and along Snow Creek where aquatic and riparian (creek bank) habitats are the primary habitat types. The USEPA *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (RBP) (Barbour et al. 1999) was used to evaluate aquatic habitat within Snow Creek. The method scores a number of stream parameters from 0 to 20 with a total possible score for ideal stream habitat of 200. The terrestrial environment (primarily the riparian corridor along Snow Creek) was assessed using the Kansas Department of Wildlife and Parks (KDWP) method for the quantitative evaluation of terrestrial wildlife habitat quality (KDWP 2004). The Kansas Parks Method (KPM) is a terrestrial analog of that used in the RBP. The method is used to assign a value from 0.0 to 10.0 (a KP Value Score) to represent the quality of an evaluated habitat compared to an optimum habitat, which is represented by a score of 10.

Five survey locations were selected along Snow Creek: one upstream of the confluence with the 11<sup>th</sup> Street Drainage Ditch, and four within the OU-1/OU-2 portion of Snow Creek (Figure 2-1). Work done prior to 2005 indicated that habitat components of OU-1/OU-2 are isolated patches in intensely developed, urbanized, and managed landscapes. Much of the terrestrial habitat that exists at the OU-1/OU-2 portion of Snow Creek is confined to narrow (and sometimes fragmented) bands of habitat along Snow Creek that are surrounded by a well-established urban setting of commercial, industrial, and residential land uses.

Within the creek, there are a number of areas containing concrete sluiceways in upstream reaches of Snow Creek (Figure 2-1) that have eliminated bank habitat,



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substrate, and a functional floodplain. Land is developed immediately along the creek in these areas (Figure 2-1). There are some areas of Snow Creek where small pools, riffles, and runs may provide limited habitat for aquatic organisms; however, these areas are limited in size relative to the overall length of the creek. Based on information on limited aquatic habitat and reconnaissance work done for the 2005 survey work, the five survey locations were selected to be biased toward the highest quality habitat locations. The results of the RBP and the KPM are summarized in Tables 2-1 and 2-2, respectively. As shown on these tables, the quality of the riparian corridor habitat is considered poor, and the creek habitat is considered fair.

In addition to the RBP and KPM, plant, macroinvertebrate, fish, and wildlife species observations were made during the 2005 biological survey work. With the exception of Station 1 (the upstream station), no aquatic vegetation was observed in any of the survey locations. However, some aquatic plants were observed during previous survey work. The benthic macroinvertebrate survey showed the greatest diversity and abundance of species was found in Stations 1 and 2 with lower values by comparison in Stations 3, 4, and 5. The fish observed primarily consisted of small minnow-like fish such as mosquitofish (Gambusia holbrooki) and stonerollers (Campostoma oligolepis). Station 4 had the highest number of fish and the highest diversity of species found with eight taxa and 177 fish. The wildlife species (including birds, mammals, reptiles, amphibians, and crustaceans) that were observed during the 2005 survey and in previous survey work are summarized in Table 2-3. Eleven bird species were observed feeding or foraging within at least one of the survey areas in 2005, and nine others were seen resting or identified by call. The tree swallow (Tachycineta bicolor) was the only bird species observed nesting in the area. Only two mammal species were observed, and four mammals were identified based on tracks. The muskrat (Ondatra zibethica) was the only mammal for which a den, hut, or burrow was observed. Several frog species were heard calling, but the American toad (Bufo americanus) and the Southern two-lined salamander (Eurycea cirrigera) were the only amphibians observed. Two turtles and two snakes were observed and/or seen foraging. These observations of habitat quality and species presence are used to support the selection of AEs and representative receptors below.

## 2.2 COPC Selection

A total of 28 constituents were identified in the Partial Consent Decree (PCD) for the Site (USEPA 2002), and these 28 constituents were evaluated in the SLERA (BBL 2005). The SLERA compared maximum sediment concentrations to conservative ecological screening values and did not eliminate any constituents from further





consideration. Note that no screening values were available for 17 of the 28 constituents on the list. In 2005, USEPA clarified a desire for future investigations at the Site to include limited analyses (10% of the samples) for a "wider list of constituents" (USEPA 2005a), which included target compound list (TCL) volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), PCDD/PCDFs, and target analyte list (TAL) inorganics, in addition to the chemicals included in the PCD list. The RI Report for OU-1/OU-2 includes an evaluation of the wider list of constituents by comparing constituent concentrations to a range of available screening criteria and background datasets, considering frequency and magnitude of any exceedances and considering the distribution of concentrations relative to the Facility (OU-3). The results of this evaluation support PCBs as the primary risk driver for OU-1/OU-2. In further evaluation conducted by USEPA, (which considered background concentrations, bioaccumulation and USEPA Region 4 sediment screening values), eight other constituents, in addition to PCBs, were identified as possibly indicating risk (regardless of whether Site-related), and these constituents were carried forward for evaluation in this SERA. The COPCs evaluated in this SERA are PCBs, barium, chromium, cobalt, lead, manganese, mercury, nickel, vanadium, and PCDDs/PCDFs and DL-PCBs<sup>1</sup>.

## 2.3 Conceptual Site Model

The USEPA guidance on conducting ecological risk assessments defines exposure pathways as "the paths of stressors from the source(s) to the receptors" (USEPA 1998). The USEPA (1997) describes a complete exposure pathway in terms of four components:

- 1. A source and mechanism of chemical release
- 2. A relevant transport medium
- 3. A receptor at a point of potential exposure to the affected medium
- 4. A route of uptake at the exposure point

-

<sup>&</sup>lt;sup>1</sup> The detailed evaluation of PCDDs/PCDFs and DL-PCBs is presented in Appendix D to this SERA. The general approach for evaluation is consistent with the approaches used herein. The relevant details and findings are presented throughout the SERA, and a summary of the risk findings is included in the conclusions of this report.



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If any one of these four components is not present, a potential exposure pathway is considered incomplete and is not evaluated further in a risk assessment. If all four components are present, a pathway is considered complete. As described previously in the ecological setting, and in more detail in the SLERA (BBL 2005), terrestrial exposure pathways are expected to be minimal due to the limited and poor quality terrestrial habitat. Thus, this SERA is focused on the aquatic food chain. The complete pathways identified for the aquatic food chain are shown in Figure 2-2 and were based on area-specific observations (see Section 2.1) as well as consideration of the available prey-base within the OU-1/OU-2 portion of Snow Creek. This figure illustrates the constituent sources (COPCs in Snow Creek sediment), release mechanisms, exposure media, exposure pathways, exposure routes, and ecological receptors potentially present within the Snow Creek portion of OU-1/OU-2.

Complete exposure pathways can be further delineated into those expected to have more significant exposure potential (primary exposure pathways), those that are complete but are expected to be minimal compared to the identified primary exposure pathways (secondary exposure pathways), and those expected to be insignificant due to minimal or unappreciable exposure potential (de minimus exposure pathways). For aquatic-feeding receptors, the potential exposure routes are direct contact with the COPC in water or sediment and ingestion of food. The particular COPCs at this site are relatively insoluble in water and tend to adhere tightly to sediments. Thus the bioaccumulation models used in the risk assessment compared concentrations in prey tissues to concentrations in the sediment. Because direct exposure of wildlife to PCBs in surface water is expected to be minimal, compared to exposure through bioaccumulation in the food web, ingestion of surface water is considered a secondary pathway for birds and mammals feeding in Snow Creek. The benthic invertebrate community, and aquatic organisms may be directly exposed to COPCs in sediments and surface water. Potential risk to populations and communities of aquatic organisms through direct exposure to surface water is evaluated in Section 3.2 through comparison of available surface water data to national recommended water quality criteria for protection of aquatic life. In this SERA, only the primary pathways that are expected to be prevalent and to represent the high end of possible exposure are evaluated quantitatively. Specifically, there is a limited fish community present within the OU-1/OU-2 portion of Snow Creek (i.e., primarily small minnow-like fish such as mosquitofish and stonerollers) and the exposure pathway between sediment and fish is considered to be a secondary pathway. Likewise, fish eating upper trophic-level receptors are not expected to have a high probability of exposure based on the limited availability of prey fish and this pathway is also considered secondary in this assessment. In addition, reptiles and amphibians have been observed within the OU-



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1/OU-2 portion of Snow Creek. However, because observations were limited and sufficient toxicity data for reptiles and amphibians are not readily available, this pathway is also not quantitatively evaluated. The primary pathways that have the highest potential for exposure are quantitatively evaluated in this SERA and are shown on Figure 2-2. Because the aquatic habitat within the OU-1/OU-2 portion of Snow Creek is generally degraded or of poor quality, it is unlikely that there would be a sufficient prey-base to support local populations of receptors. Rather, the OU-1/OU-2 portion of Snow Creek would more likely support transient exposure (e.g., to seasonal or migratory birds such as the spotted sandpiper), or wide ranging opportunistic receptors (e.g., the raccoon). Thus, the evaluation of the primary pathways shown on Figure 2-2 is expected to be conservative and protective of the secondary or less significant, pathways that were identified as complete but that will not be quantitatively evaluated herein.

For the aquatic habitats within OU-1/OU-2, complete pathways that are identified as significant and will be quantitatively evaluated are:

- Sediments and benthic invertebrates
- Sediments/contaminated prey and herbivorous, invertivorous, and omnivorous birds and mammals

## 2.4 Assessment Endpoints

AEs are formal expressions of the actual environmental value to be protected from risk (Suter et al. 1993) and are typically tied directly to specific ecological values needing protection. Furthermore, AEs provide a clear, logical connection between regulatory policy goals and ecotoxicological investigations.

The AEs for Snow Creek identified for evaluation in this SERA are based on the complete and significant exposure pathways identified in the CSM (Section 2.3). Consistent with Principle No. 1 of the USEPA's Office of Solid Waste and Emergency Response Directive "Ecological Risk Assessment and Risk Management Principles for Superfund Sites" (USEPA 1999), which states that, "Superfund's goal is to reduce ecological risks to levels that will result in the recovery and maintenance of healthy local populations and communities of biota," each AE is intended to protect the local populations of the identified resources.



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### 2.4.1 Survival, Growth, and Reproduction of Benthic Communities

Benthic invertebrates (e.g., amphipods; larval stages of midges, stone flies, and true flies) are valued components of the aquatic ecosystem because they sustain many elements of the food chain (other invertebrates, fish, birds, and mammals) and contribute to nutrient cycling. In addition, they live, feed, and reproduce in/on sediments where COPC concentrations may be higher than in other media. In fact, direct contact with sediments represents the primary exposure route of benthic invertebrates to sediment-bound chemicals. Therefore, the protection of the benthic invertebrate community in OU-1/OU-2 is an AE.

### 2.4.2 Survival, Growth and Reproduction of Aquatic Feeding Birds

Birds are valued components of an ecosystem, and they are consumers at various levels in the foodweb. As such, they may be exposed to COPCs through direct ingestion of sediment and sediment-associated prey. Herbivorous, insectivorous, omnivorous, and invertivorous birds have been observed at the OU-1/OU-2 portion of Snow Creek and could be exposed to the identified COPCs through the food chain.

## 2.4.3 Survival, Growth and Reproduction of Aquatic Feeding Mammals

Mammals play diverse roles in aquatic and terrestrial foodwebs and are potentially exposed to COPCs by various routes. As such, they may be exposed to COPCs through direct ingestion of sediment and sediment-associated prey.

## 2.5 Representative Receptors

Because it is not feasible to evaluate all possible species of birds and mammals, specific surrogate, or representative, species were selected to represent the AEs for birds and mammals. Specifically, representative receptors were chosen to represent a range of feeding guilds including herbivores, insectivores, omnivores, and invertivores. As discussed above, piscivorous receptors are not evaluated due to the ephemeral nature of areas of the creek and the low number of fish present. Observations of prey types present within the OU-1/OU-2 portion of Snow Creek (e.g., aquatic vegetation and benthic invertebrates, and limited availability of prey fish), from previous ecological survey work were used to determine which bird and mammal feeding guilds are likely to have the highest potential exposure. Each of these guilds was selected to represent the high end of exposures for the range of COPCs being evaluated. To select representative species, observations from Site surveys and input from the USEPA





were used to identify the following representative bird and mammal species for the identified AEs and feeding guilds:

- The mallard (Anas platyrhynchos) was selected to represent aquatic feeding herbivorous birds.
- The tree swallow (Tachycineta bicolor) was selected to evaluate insectivorous birds.
- The pied-billed grebe (Podilymbus podiceps) was selected to evaluate aquatic omnivorous birds.
- The spotted sandpiper (Actitis macularius) was selected to represent aquatic ground-feeding insectivorous/invertivorous birds.
- The muskrat (Ondatra zibethicus) was selected to evaluate semi-aquatic herbivorous mammals.
- The little brown bat (Myotis lucifugus) was selected to represent aerial feeding insectivorous mammals.
- The raccoon (Procyon lotor) was selected to represent omnivorous mammals.

The tree swallow, muskrat, and bat<sup>2</sup> have been observed within the OU-1/OU-2 portion of Snow Creek (BBL 2005). While not observed during the survey, the mallard and raccoon have been observed incidentally during other Site activities. The sandpiper and grebe are evaluated as a reasonably likely exposure scenario based on their dietary preferences and the prey types present.

## 2.6 Measurement Endpoints and Risk Questions

The AEs established for OU-1/OU-2 cannot be directly measured; therefore, MEs related to each AE were defined based on specific risk questions (RQ) for each AE. MEs are quantitative expressions of observable or measureable changes that are used to evaluate the effects of chemical stressors on the receptor species AEs (USEPA

<sup>&</sup>lt;sup>2</sup> While the little brown bat was not observed on the site, another similar bat species (*Microchiroptera* sp.) was observed.





1997). The MEs are then used to make inferences about the potential effects to the AEs. For this streamlined assessment, MEs were selected to represent the most likely exposure scenario.

AE 1: Survival, growth and reproduction of benthic communities

RQ: Are the levels of COPCs in whole sediments from OU-1/OU-2 greater than benchmarks or risk-based concentrations protective of survival, growth, or reproduction of aquatic invertebrates?

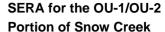
 ME: Compare sediment toxicity benchmarks or values for benthic community to measured COPC concentrations in sediment

**AEs 2 and 3**: Survival, growth, and reproduction of aquatic feeding birds (AE 2) and mammals (AE 3)

RQ: Do modeled daily dietary doses of COPCs for aquatic-dependent birds and mammals (including herbivorous, invertivorous, insectivorous and omnivorous birds, and herbivorous and omnivorous mammals) from consumption of/exposure to food and sediment from OU-1/OU-2 exceed the TRVs for survival, growth, or reproduction of birds and mammals?

 ME: Compare measured concentrations of COPCs in sediment to SSRBCs for birds and mammals for each COPC

SSRBCs for birds and mammals are calculated using a dietary foodweb model for each respective species and a TRV protective of survival or growth in birds or mammals (e.g., no-observable-adverse-effects levels [NOAELs] and lowest-observed-adverse-effects levels [LOAELs], as available). Specific details of the SSRBC calculations and input parameters are provided in Sections 4 (receptor exposure inputs) and 5 (TRVs).





#### 3. Data Evaluation

Data inputs needed in this SERA to evaluate the AEs and MEs identified in Section 2 include surface sediment COPC concentrations for estimating exposure to the benthic community and both sediment and biotic prey tissue for estimating dietary exposure for upper trophic-level receptors. In addition, surface water data are available and were considered for inclusion in this assessment. Because the surface water data have a high level of associated uncertainty, as discussed further in Section 3.2, and because exposure pathways between receptors and surface water are considered secondary, these data are not included in the quantitative evaluation of upper trophic level receptors herein but are summarized and discussed in Section 3.2 below. The following sections describe the available data that were considered for use in this OU-1/OU-2 SERA. For PCBs, data are presented as total PCBs based on the sum of detected Aroclors or detected homologs. If one or more Aroclor or homolog group was detected, the non-detected values for other Aroclor or homologs were not added to the total reported concentrations. If no Aroclors or homologs were detected, the highest reporting limit for either a single Aroclor or homolog group was used for reporting purposes.

### 3.1 Sediment Dataset for the OU-1/OU-2 Portion of Snow Creek

Surface sediment data used in preparing this OU-1/OU-2 SERA include 43 discrete samples analyzed for total PCBs as the sum of Aroclors (Figures 3-1a and b) and 12 discrete samples analyzed for metals (Figure 3-2) that are located within the site area for this SERA. There are 12 samples upstream of the OU-1/OU-2 portion of Snow Creek that are considered along with the data within the SERA site area (Figures 3-1a and 3-2). These data were from three data sources as described below:

- The Resource Conservation and Recovery Act (RCRA) Program conducted in 1999
- 2. RI/FS Program conducted in 2006
- 3. Data collected by the USEPA



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For the RCRA Program, 34<sup>3</sup> cores and one duplicate were collected in this area and analyzed for total PCBs (tPCBs) as Aroclors and total organic carbon (TOC). In addition, three samples and one duplicate were analyzed for the 11 metals identified in the PCD, including the eight metals identified as COPCs for this SERA. The RCRA data are described in detail in the Conceptual Site Model Report (BBL 2003).

As a part of the data collected to support the RI/FS, three additional cores were collected from areas identified during the RCRA program as containing low, medium, and high sediment PCB concentrations. These three samples and one duplicate were analyzed for PCBs, TOC, and a wider list of analytes, including PCDDs/PCDFs and the eight metals being evaluated as COPCs in this SERA. The sample and duplicate collected from the high sediment deposit (S-High-1) was not included in the SERA dataset because it was collected from a depth of 0 to 18 inches and was not considered applicable for ecological exposures. The RI/FS data are described in detail in the PSCS (ARCADIS 2007b).

In addition to the RCRA and the RI/FS data, USEPA collected a variety of soil and sediment samples from residential and non-residential properties to characterize the nature and extent of PCBs in the Anniston Area. These investigations were primarily conducted in 2000 and 2001. For these data collection activities, seven additional sediment samples collected from the OU-1/OU-2 portion of Snow Creek by USEPA were identified. PCBs as Aroclors and metals were analyzed in theses samples. While these samples were not collected under specific sampling plans, they are considered valid and applicable data and are included herein for completeness.

For the purposes of this SERA, all duplicates were averaged and evaluated as a single result. A summary of the available PCB and metals data is provided in Table 3-1, and sample locations and results are shown in Figures 3-1a, 3-1b, and 3-2. These figures also present the sample data for PCBs and metals that are upstream of the 11<sup>th</sup> street ditch. These samples are shown in green boxes on Figures 3-1a and 3-2. PCDDs/PCDFs and DL-PCBs were evaluated separately, and the data are discussed in Appendix D.

The surface sediment samples used for this SERA were generally collected from a depth of 0 to 2 inches. However in some cases, sediment cores of differing depths

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<sup>&</sup>lt;sup>3</sup> In two cases, multiple sediment samples were collected from a single sediment deposit (e.g., S-2-06a, b and c and S-5-14 a and b). These samples are separated by short distances so appear as one point on Figures 3-1a and 3-1b but were discreet samples and are treated as such in the SERA.



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were taken for sediment characterization. For example, the medium PCB concentration sample location result was collected from the 0 to 8 inch horizon and the PCB result for the targeted low PCB concentration sample location was collected from the 0 to 6 inch interval. The collection interval for each sample location was the total thickness of sediment present at that location. These samples may not represent the precise exposure interval but were included for completeness and conservatism. As described above, the sample collected from a depth of 0-18 inches was not included in the dataset.

#### 3.2 Surface Water Data

The available whole water surface water data collected as a part of the RI/FS sampling reflect samples collected from the upstream end of OU-4 (Oxford Lake Park) and are considered representative of conditions in the downstream end of OU-1/OU-2 (Table 3-2). These samples were collected during three separate high flow events and characterize the surface water conditions for PCBs and metals during these events. In addition to these data, surface water data were collected during the RCRA program and are included as part of the OU-1/OU-2 RI dataset. These samples were collected from four general locations along Snow Creek and were designed to reflect surface flow conditions in two general areas of Snow Creek. The two upstream sample collection locations were selected to quantify PCB inputs from Snow Creek drainage areas located upstream of the 11th Street Ditch-Snow Creek confluence during base flow conditions. The Snow Street and Oxford Park sample collection locations were selected to be representative of conditions at the downstream end of Snow Creek prior to its confluence with Choccolocco Creek. These samples were collected to characterize the movement of PCBs and total suspended solids (TSS) during periods of base and high flow. The data include particulate PCB and TSS measurement concentrations for multiple base and high flow events (Table 3-3). The whole water and modeled surface water data from both the high and base flow sampling events are presented in Tables 3-2 and 3-3, respectively.

As indicated in Table 3-2, PCB Aroclors were not detected (at a reporting limit of approximately 0.5 micrograms per liter [ $\mu$ g/L]) in any of the whole water samples. Total PCBs as the sum of homolog groups were also determined using a more sensitive method than the 8082 Aroclor method and the data ranged from 0.2  $\mu$ g/L to 0.6  $\mu$ g/L. While PCBs were present at concentrations above the chronic water quality criterion during high flow conditions (Table 3-2), this criterion was only exceeded in three of six samples that were collected at the downstream end of OU-1/OU-2 during base flow conditions. This is relevant in assessing surface water conditions for Snow Creek in



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that base flow conditions are typically present 90% of the time. The average calculated water PCB concentrations from samples collected from Snow Creek upstream of the 11<sup>th</sup> Street Ditch confluence during base flow conditions are a factor of 10 higher than average concentrations for samples collected at the downstream end of OU-1/OU-2. The two upstream surface water sample collection locations (at 14<sup>th</sup> and 16<sup>th</sup> Streets) are located approximately 2,000 feet and 3,000 feet upstream of the Snow Creek and 11 Street Ditch, respectively.

For metals, lead exceeded the chronic criteria in one event and both chromium and lead exceeded acute and chronic criteria in one event. The surface water data were previously presented in the Preliminary Site Characterization Summary Report for OU-1/OU-2 dated December 2007 (OU-1/OU-2 PSCSR, ARCADIS 2007).

Based on data collected during the RCRA program, the high flow data are short-term in nature and not appropriate for evaluating long-term exposures to creek water. The surface water data also indicate that during base-flow conditions, PCB contributions from Snow Creek are low and PCB transport under high flow conditions is greater than during base-flow conditions.

Even with this potential bias, only three of six of the calculated values exceeded the surface water criteria for PCBs of  $0.014 \mu g/L$  under base flow conditions.

### 3.3 Biota Data

Based on the range of ecological receptors identified for foodweb evaluation, COPC data representing tissues of aquatic plants, emergent aquatic insects, benthic invertebrates (including crayfish, mollusks), and amphibians/reptiles are needed. Because biota data have not been collected within the OU-1/OU-2 portion of Snow Creek, sediment and biotic tissue data available from the biological sampling conducted for OU-4 were used to develop uptake models for estimating prey tissue concentrations.

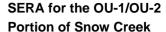
The available data were collected from three ecologically distinct reaches (EDRs). The upper, middle, and lower reaches were identified within OU-4 based on habitat surveys conducted in the Phase I Ecological Survey (ARCADIS BBL 2007). Three aquatic biological sampling areas (BSAs) were identified within each of the three EDRs for a total of nine aquatic BSAs within OU-4. Samples were also collected from three aquatic reference locations. In general, biotic tissue samples were not precisely colocated with specific sediment samples.



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Sediment and biotic tissue data were analyzed for PCBs and mercury in all of the BSAs and reference locations. Sediment data were also analyzed for TOC and percent fines and tissue data were analyzed for lipid and percent solids (see Appendix A). In general, six sediment samples and three composite tissue samples of each type were collected from each BSA and reference area and analyzed for PCBs and mercury. Consistent with the agreed upon sampling approach, metals were analyzed in a subset of the samples collected. Specifically, metals were analyzed in sediment samples from six BSAs and two reference locations. For tissue, metals were analyzed in two to three BSA samples and one reference sample for each tissue type. The data are described below. Tables 3-4 through 3-6 summarize the available PCB, mercury. and other metals data, respectively, for each BSA. In addition to the BSA sediment data, some of the historical sediment samples fell within a reasonably close proximity to the BSAs. These sediment samples were included in the sediment dataset for the respective BSA. These samples are also included in Tables 3-4 through 3-6. Additional detail regarding data handling for calculation of uptake factors can be found in Section 4.3.1 and Appendix A.

Efforts were made to collect all biotic tissues in each of the three habitat types that were targeted (i.e., emergent vegetation, riffle, and run). However, specific tissue types were not always found in each habitat. Exceptions and specific tissue types collected are noted below. Aquatic plants, emergent insects, and benthic invertebrates were collected in all BSAs and reference areas. Aquatic plants collected consisted primarily of the stems and leaves of alligator weed. Emergent insects primarily consisted of crane flies, damselflies, and dragonflies. Benthic invertebrate samples consisted of odonata larvae. Crayfish and mollusks were collected in all nine BSAs and three reference areas but were not found in all habitat types. One to three composite samples were collected opportunistically in either emergent vegetation, riffle, or run habitats in each area. Snakes and frogs were collected opportunistically as samples were not found in all areas and habitat types. Species of frogs collected include southern leopard frogs (Thobates sphenocephalus), bullfrogs (Rana catesbeiana), bronze or green frogs (Rana clamitans), and northern cricket frogs (Acris crepitans). Snake species collected include midland water snake (Nerodia sipedon), queen snake (Regina septemvittata), cottonmouth (Agkistrodon piscivorus), and yellow-bellied water snake (Nerodia erythrogaster).





## 4. Exposure Assessment

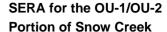
This section describes the underlying assumptions used to estimate exposure to each of the AEs. Benthic invertebrates are evaluated based on direct contact with sediment. Upper trophic-level receptors (Birds and Mammals) are evaluated based on modeled dietary food chain exposure. Both sediment and food chain exposure estimates are described below.

### 4.1 Sediment Exposure Estimates

In general, to evaluate relevant ecological exposures, the surface sediment data from 0 to 2 inches were used, although in some cases deeper depths were also included. This depth interval encompasses the biologically active zone where the majority of the contact between ecological receptors, their prey, and sediment is likely to occur. Individual sample concentrations were used to estimate receptor exposure to COPCs. Exposure estimates for PCDDs/PCDFs and DL-PCBs are based on individual sample toxic equivalency (TEQ) concentrations. TEQs were calculated for avian and mammalian receptors using dioxin toxic equivalency factors (TEFs) from USEPA (2008) and Van den Berg (2006), respectively, and are described in more detail in Appendix D. In addition to individual sample point exposure estimates, for PCBs and metals the 95% upper confidence limit (UCL) on the mean was calculated using ProUCL (v. 4.1.01; USEPA 2011). Duplicates were averaged before including those values in Pro UCL. Non-detects were included using the reporting limit to calculate the 95% UCL concentration. The 95% UCL recommended by Pro UCL was selected. Figures 3-1a, 3-1b, and 3-2 show individual surface sediment concentrations for PCBs and metals. Summary statistics for the available data for PCBs and metals are provided in Table 3-1. The data and summary statistics for PCDD/PCDFs and DL-PCBs are provided in Appendix D.

## 4.2 Exposure Units

The four miles of creek being evaluated in this SERA have not been explicitly divided into exposure units. Rather, the measured COPC concentrations in each individual sample location were compared to the range of benchmarks/toxicity values identified and the SSRBCs that were calculated. The potential impact of a particular sample location result on receptors and receptor populations is discussed in the risk characterization section.





## 4.3 Dietary Exposure Model

As described previously, exposure to birds and mammals is evaluated in this SERA using a dietary exposure estimate. Dietary exposure in the form of a daily dose is estimated using methods that are consistent with USEPA guidance (1997). A daily intake represents an estimate of a constituent dose that a receptor might receive per day and was calculated by summing all intakes for complete and significant exposure pathways (i.e., dietary and incidental floodplain soil ingestion) for each wildlife receptor. The dietary dose model employed for the OU-1/OU-2 SERA follows the form:

Equation 1: 
$$ADD_{pot} = \overset{\circ}{\mathbf{a}} (C_k * DF_k * NIR) + (NIR * EPC_{sed} * DF_{sed}) * SUF$$

Where:

ADD<sub>pot</sub> Potential average daily dose (milligrams/kilogram body weight per day [mg/kg BW-d]) Number of food types n  $C_k$ EPC for the kth food type (mg/kg, dry weight [dw]) Dietary fraction of intake of the kth food type (range 0 to 1.0) DF₄ NIR Normalized ingestion rate (dw of food ingested per kilogram of BWd [kg dw/kg BW-d]) **EPC**<sub>sed</sub> Exposure Point Concentration in sediment (mg/kg, dw) Dietary fraction of sediment ingested (range 0 to 1.0) DF<sub>sed</sub>

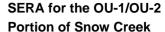
## 4.3.1 Prey Tissue Concentration Estimates

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SUF

Because prey tissue was not measured in OU-1/OU-2, the exposure point concentration (EPC) for prey tissue ( $C_k$ ) was modeled using a BAF along with the sediment EPC (EPC<sub>sed</sub>). As discussed in Section 3.3, the biotic data collected within OU-4 were used to develop uptake models or BAFs. Additional discussion of the specific data available for BAFs is provided in Section 3.3 and Appendix A. The BAFs for PCBs were also used as the surrogates for PCDD/PCDFs as described in Appendix D.

Site use factor (assumed to be 100%)





The bioaccumulation model represents the relationship between the sediment and the measured prey tissue concentration. It is expressed either as a function based on regression analysis of exposed sediment concentrations and biotic tissue concentrations (e.g., for a linear model, tissue concentration [y] = slope [m] of the line x soil concentration [x] + the y intercept [b]), or as a simple ratio.

For example:

Equation 2: 
$$BAF = \frac{C_{\text{benthic invertebrate}}(mg/kg - dw)}{C_{\text{sediment}}(mg/kg - dw)}$$

Thus,

$$C_{benthic invertebrate} = BAF_{benthic invertebrate} \times C_{sediment}$$

For this SERA, the ingestion rates for the identified receptors are based on dry weight estimates (see Section 4.4.3). As such, it was necessary to estimate prey tissue concentrations in dry weight. For biotic tissues, the COPC concentrations are reported from the laboratory as wet weight. The fraction of solids in each sample was also measured. Thus the fraction of solids was used to calculate a dry weight concentration from each reported wet weight tissue concentration (concentration as mg/kg wet weight/fraction solids – see Appendix A). Available sediment and biotic tissue data were evaluated in detail to determine if significant predictive relationships existed between sediment and various tissue types. For PCBs, possible correlations were evaluated based on sediment measured as Aroclors and homologs on a dry weight, organic carbon normalized and fines normalized basis compared to biotic tissues measured as Aroclors or homologs on a dry weight, wet weight, and lipid normalized basis. For mercury, possible correlations were evaluated based on sediment dry weight and fines normalized and tissue on a wet weight and dry weight basis.

For PCBs, a significant (i.e.,  $r^2 > 0.3$  and p < 0.1) positive relationship was found between PCB measured as Aroclor in sediment normalized to percent fines and benthic invertebrate tissue on a wet weight basis. No positive and significant relationships were identified for other tissue types. For mercury, a significant positive relationship was found between sediment normalized to fines and wet weight and dry weight tissue concentrations for frogs. Because no other significant relationships between fines normalized sediment and biotic tissue was identified and fines were not correlated with PCB or mercury concentrations, this regression was not selected for use in this SERA. Appendix A provides a detailed description of the correlation



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analyses conducted. As no other significant relationships were identified, tissue concentrations were estimated in this SERA based on ratios (Appendix A). The BAFs selected for use in this SERA are summarized in Table 4-1 and plotted relative to the OU-4 measured tissue data in Figures 4-1 and 4-2 for PCBs and mercury, respectively. As shown on these graphs, the selected median BAFs generally provide a good estimation of central tendency and are not highly influenced by non-detected tissue concentrations (shown as open symbols on figures). An evaluation of the implications and uncertainty associated with the use of a ratio BAF rather than the regression for benthic invertebrates discussed above is provided in Section 6.3.2.

In addition to the field data, laboratory bioaccumulation data for PCBs are available based on bioaccumulation testing done with benthic invertebrates (*lumbriculus verigatus*) with OU-4 and reference sediments. Specific details of the analyses and methods employed during laboratory bioaccumulation testing as well as the data are presented in draft form in Ingersoll et al (in review). These data were evaluated for correlation between sediment and tissue concentrations (Appendix A), and significant fits were found between sediment and tissue on a wet weight/dry weight basis as well as on a lipid and organic carbon normalized basis. As such, regression based on wet weight tissue and dry weight sediment was selected for use as a secondary assessment for this component of the diet of the receptors evaluated. This alternative laboratory-based scenario is also discussed with the scenario based on the field data in Section 6.

### 4.4 Exposure Parameters

For wildlife receptors, exposure parameters such as dietary composition, body weight (BW), and food ingestion rates (FIRs) are defined and summarized in Tables 4-2 and 4-3. In this section, exposure and intake assumptions are defined on the basis of available literature information and best professional judgment using the USEPA's Wildlife Exposure Factor Handbook (USEPA 1993) and other sources as necessary and appropriate.

## 4.4.1 Body Weight

BW values for spotted sandpiper and raccoon were obtained from the USEPA (1993), determined by the average weights for adult males and females. The BW for the little brown bat was taken from the Nagy (2001) publication in which the FIR for the little brown bat was derived. BWs for mallard, tree swallow, pied-billed grebe, and muskrat were derived from literature, averaging values where appropriate. Mallard BW was an



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average of three surveys of North American non-breeding adult birds (males and females averaged) (Drilling et al. 2002). Robertson et al. (1992) report a mean BW of 21 grams (g) for adult tree swallows in Ontario. BW for pied-billed grebe was the average of males and females reported in Muller and Storer (1999). Muskrat BW was the average of the BW range provided in Reid (2006).

## 4.4.2 Dietary Composition

The composition of the diet ( $FR_k$ ) for mammals and birds, expressed as a fraction of the total diet, was generally developed based on diets provided in the Wildlife Exposure Factor Handbook (USEPA 1993). When diet for a specific species was unavailable, diet composition was based on life history information found in the peer-reviewed literature. Because the OU-1/OU-2 area does not support a significant forage fish community, the diets of species that normally eat fish (raccoon and pied-billed grebe) were adjusted such that the entire diet could consist of prey items found within OU-1/OU-2.

The mallard, a dabbling duck, was evaluated as an herbivorous receptor. Mallard diets show geographic and seasonal variation, but a study in Louisiana cited by the USEPA (1993) showed that mallards can have an entirely herbivorous diet. It was also assumed that mallards would incidentally ingest small numbers of benthic invertebrates and mollusks. A sediment ingestion rate of 6.0% was taken from an average of Beyer et al. (1994) (n=88 samples) and Connor (1993). An alternative dietary scenario based on an omnivorous diet for mallards is also included in the uncertainty analysis in Section 6.3.1.

The tree swallow and little brown bat are aerial insectivores that primarily consume emergent and flying insects in flight near or occasionally off the surface of water (Robertson et al. 1992; Belwood and Fenton 1976, as cited in Sample and Suter 1994). Thus, both the tree swallow and little brown bat diet are assumed to consist of 100% emergent insects. Because of their aerial foraging habits, sediment ingestion was assumed to be negligible for both tree swallow and little brown bat.

The spotted sandpiper is a small shorebird that frequents shorelines, shallow water (1 to 3 inches), and upland areas adjacent to water bodies. Oring et al. (1997) reported that spotted sandpipers are opportunistic and consume a wide variety of invertebrate prey occurring in these transitional areas. Therefore, a diet consisting of 50% emergent and flying insects and 50% benthic invertebrates was deemed an appropriate diet composition for spotted sandpiper. Sediment ingestion rate was an



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average of FIRs for four closely related species with similar foraging habits (stilt sandpiper, semi-palmated sandpiper, least sandpiper, and western sandpiper) (Beyer et al. 1994) and was, therefore, considered to be representative of the spotted sandpiper.

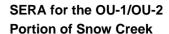
The pied-billed grebe is a small aquatic diving bird that was chosen as an avian omnivore receptor because of its varied diet. The diet described by Wetmore (1924, as cited in Muller and Storer (1999) was used for the pied-billed grebe's diet composition. However, Wetmore (1924, as cited in Muller and Storer 1999) included a 20% fish component. Because fish are not likely to present in OU-1/OU-2 in sufficient quantity to constitute a significant dietary item for birds, the grebe's diet was adjusted based on professional judgment to include a reptile/amphibian (Muller and Storer 1999 include amphibians in a list of prey items) and an aquatic vegetation component. No sediment ingestion rates were available for the pied-billed grebe. The mallard was chosen as a surrogate for sediment ingestion rate because it shares similar foraging habits as the pied-billed grebe.

The muskrat is a large rodent that primarily consumes aquatic emergent plants including cattails, rushes, grasses, and seeds (USEPA 1993; Reid 2006). It was, therefore, chosen as a mammalian herbivorous receptor. The muskrat diet was based on the USEPA (1993), however, in stream and river habitats, muskrat diet can include mollusks (Neves and Odom 1989). Thus, an alternative dietary composition for the muskrat is evaluated in the uncertainty analysis in Section 6.3.1. A sediment ingestion rate for muskrats was not available; therefore, the sediment ingestion rate for the raccoon (Beyer et al. 1994) was used as surrogate based on the similarity of foraging habits.

The raccoon is an opportunistic omnivore with a diet that varies widely geographically and seasonally. They often forage along streams for a variety of aquatic and terrestrial plant and animal food items (Reid 2006). Diet composition was adapted from the USEPA (1993) using professional judgment based on food items available at OU-1/OU-2. Beyer et al. (1994) provide an average sediment ingestion rate of 9.4% based on four studies.

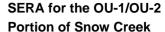
## 4.4.3 Ingestion Rates

For consistency across receptors and dietary components, ingestion rates for all receptors are based on allometric equations developed by Nagy (2001) that estimate intake based on metabolic need of specific species, taxon, or feeding guilds. Total





FIRs for birds and mammals expressed in kg/kg BW-d dw were calculated as a function of body mass, using the appropriate allometric equations. For the little brown bat, Nagy (2001) calculated a dry matter ingestion (DMI) rate of 1.6 grams per day (g/d), which was BW normalized to 0.178 kg/kg BW-day dw, based on a 9 g bat. For the muskrat, FIR was based on a taxon-specific (rodentia) regression coefficient. No appropriate species DMI or taxon-specific ingestion rates were deemed appropriate for mallard, tree swallow, spotted sandpiper, pied-billed grebe, or raccoon. For the mallard, information available in the literature was available to develop an FIR. Specifically, a mean value from Chukwudebe et al. (1998) was selected and converted to dry weight using an assumption of 12% moisture in the diet (Amici et al. 1997; Gold Coin Feed Inc.) and the mallard body weight of 1.2 kg discussed above. For the remaining species, general regression coefficients were used: avian insectivore for tree swallow and spotted sandpiper, avian omnivore for pied-billed grebe, and mammalian omnivore for raccoon (Nagy 2001).





#### 5. Effects Assessment

The effects assessment describes the selection and development of the toxicity benchmarks and TRVs used to calculate site-specific risk-based concentrations for benthic invertebrates, birds, and mammals.

## 5.1 Benthic Community Toxicity Benchmarks and Values

For the benthic community, a sediment-based toxicity benchmark for PCBs was developed based on Site-specific bioassays that were conducted within OU-4. This benchmark and its development are summarized below and in more detail in Appendix B. For metals, benchmarks were selected from the consensus-based sediment quality guidelines developed by MacDonald et al. (2000b). These threshold effect concentrations (TECs) and probable effect concentrations (PECs) are used as screening levels to identify the potential for toxic effects and are summarized in Table 5-1.

## 5.1.1 Sediment PCB Site-Specific Toxicity Values

Although toxicity tests were not conducted with sediments from OU-1/OU-2, a series of toxicity tests was conducted with sediments collected from OU-4 as part of a BERA being prepared for that OU. Because PCBs were the dominant toxicant in the OU-4 sediments (see below and Appendix B), concentration-response relationships determined from the results of the OU-4 sediment-toxicity tests can be used to predict the toxicity of PCBs in the OU-1/OU-2 sediments.

The 32 sediments samples (a total of 26 sediment samples from six different locations in OU-4, and six reference sediment samples from Choccolocco Creek approximately 3 kilometers upstream of OU-4) collected for toxicity testing collectively spanned a wide range of combinations of tPCBs and organic carbon (OC) concentrations, instead of randomly sampling the OU-4 sediments. The six targeted bins of OC-normalized PCB concentrations (expressed as mg tPCB/kg OC) were: <100; 100-500; 501-1,000; 1,001-5,000; 5,001-10,000; and >10,000. The purpose of the toxicity tests was to develop concentration-response relationships for the various *H. azteca* and *C. dilutus* endpoints, not to determine which specific sediments across the Site (including OU-1/OU-2 and/or OU-4) were toxic. The sediments selected for the toxicity testing program were not randomly chosen, but instead, were collected from a few targeted locations to provide a wide range of combinations of PCB and OC concentrations were tested. For those reasons, it is not appropriate to compare the test sediments to the



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reference condition, but the toxicity test results will be used as intended to identify a range of concentration-based toxicity thresholds.

Chronic toxicity tests were conducted on 31 different sediments (20 sediment samples from OU-4, six reference sediment samples, and duplicate tests for five of the 20 OU-4 sediments were tested in each of the two cycles of toxicity tests, resulting in a total of 27 toxicity tests conducted with non-control sediments). The toxicity tests were conducted by the U.S. Geological Survey's Columbia Environmental Research Center in Columbia, Missouri, and the U.S. Army Corps of Engineers' Engineer Research and Development Center in Vicksburg, Mississippi (ARCADIS 2010). Because of the large number of tests and associated logistical requirements, the tests were conducted in two separate testing cycles that were started during the week of November 1, 2010, and during the week of January 17, 2011.

Test organisms included a freshwater amphipod (Hyalella azteca; 42-d tests) and midge (Chironomus dilutus; up to 54-d tests). The sediment toxicity tests were conducted according to standard procedures specified in USEPA (2000) and American Society for Testing and Materials (ASTM) International (2012). Twelve survival, growth, and reproduction endpoints were measured in the C. dilutus tests; and 11 survival, growth, and reproduction endpoints were measured in the H. azteca tests (Appendix B, Table B-1). The sediments were analyzed for six grain-size categories, moisture content, loss on ignition, concentrations of OC, 23 major and trace elements (including the 16 metals and metalloids on the USEPA Target Analyte List), acid volatile sulfide, five simultaneously extracted metals, nine PCB Aroclors, 13 PCB congeners, 10 PCB homolog groups, one biphenyl, 46 parent and alkylated polycyclic aromatic hydrocarbons, 21 organochlorine pesticides, and 17 PCDD/PCDF congeners. Additionally, during the toxicity tests, porewaters were analyzed for pH; conductivity; alkalinity; hardness; and concentrations of ammonia, hydrogen sulfide, dissolved OC, four inorganic anions, and 61 major and trace elements. Specific details of the analyses and methods employed during the testing program and the sediment toxicity and laboratory bioaccumulation testing data are presented in draft form in Ingersoll et al (in review).

Concentrations of metals, PAHs, and organochlorine pesticides were generally lower than "consensus-based" PECs published by MacDonald et al. (2000b). Therefore, those COPCs are not likely to have contributed significantly (relative to PCBs) to toxicity in OU-4 sediments, leaving PCBs as the likely dominant contaminant. Therefore, the remainder of this discussion about OU-4 sediment toxicity tests focuses only on PCBs.



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Because the chronic toxicity tests for each species were conducted in three separate batches (at different times and/or in different labs) and the control responses sometimes differed considerably among those batches (Appendix B, Table B-2), the response measured for each endpoint for each species was normalized to the average response measured for that endpoint in the control sediment tested concurrently with that batch of sediments. Therefore, the response for each endpoint in each sediment was expressed as a percentage of the control response; and thus, control-normalized responses greater than 100% sometimes occurred in reference and/or Site sediments.

After control normalization, each endpoint response was regressed against tPCB concentration using a logistic equation to produce a sigmoid concentration-response relationship. Regression equations were determined separately for dw-normalized tPCB Aroclor (tPCB<sub>A</sub>) concentration and for OC-normalized tPCB<sub>A</sub> concentration to develop two concentration-response relationships for each endpoint. The dw-normalized and OC-normalized tPCB<sub>A</sub> concentrations were chosen as the predictors for the concentration-response relationships because sediments at OU-4 had been previously characterized in terms of their tPCB<sub>A</sub> concentrations instead of their tPCB homolog (tPCB<sub>H</sub>) concentrations, thus necessitating development of toxicity-predictor equations based on tPCB<sub>A</sub> concentrations for use in remediation decisions.

To determine background toxicity, a reference envelope was calculated for each endpoint using the control-normalized responses of the six reference sites. The "bottom" of that response envelope was defined as the lowest control-normalized response percentage observed in the six reference sediments, and 10, 20, and 50% effect concentrations (EC10\*, EC20\*, and EC50\* values, relative to the "bottom" of the reference envelope) were calculated from the PCB-response regressions for each survival, growth, and reproduction endpoint. By this definition, the EC0\* value is the regression-predicted concentration at the "bottom" of the reference envelope. Then, TECs of PCBs were calculated from the concentration-response relationships. The "bottom" of the response envelope was defined as the lowest response percentage instead of as the 5<sup>th</sup> percentile of the reference-sediment response percentages because only six reference sediments were tested, thus leaving high uncertainty about the true numerical value of the 5<sup>th</sup> percentile reference response.

Toxicity values were developed for the EC0\*, EC10\*, and EC20\* values. The ultimate selection of sediment cleanup levels by the USEPA may in part be based on this range of effect levels and might consider the variability in the responses among the two cycles of testing and the test acceptability criteria for control mortality.



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The most sensitive endpoints for *H. azteca* related to reproduction (the lowest EC0\*, EC10\*, and EC20\* values [i.e., 0, 10, and 20%-impairment beyond the "bottom" of the reference envelope]) were 1.38 (the EC0\*), 2.58 (the EC10\*), and 4.43 (the EC20\*) mg tPCB<sub>A</sub>/kg dw of sediment for 42-d young/female normalized to 42-d survival (Appendix B, Table B-1). The most sensitive endpoints for *C. dilutus* were related to emergence (the lowest EC0\*, EC10\*, and EC20\* values were 2.04 [the EC0\*], 6.80 [the EC10\*], and 14.3 [the EC20\*] mg tPCB<sub>A</sub>/kg dw of sediment, for percent emergence of the pupae from their cocoons; Appendix B, Table B-1). The adult biomass endpoint for *C. dilutus* that was reported by the laboratories is not included in this analysis because it was based on estimated instead of measured weights of adult *C. dilutus*, thus making that endpoint highly uncertain.

Based on this analysis, a range of toxicity values are considered. Specifically, the EC0\* (1.38 mg/kg) and EC20\* (4.43 mg/kg) toxicity values for the most sensitive endpoint and species from the site-specific toxicity testing will be compared to Site PCB data in Section 6.

#### 5.2 Avian and Mammalian TRVs

Following USEPA guidance (1997), dietary TRVs for birds and mammals were developed based on endpoints that could result in population-level impacts such as survival, reproduction, development, and growth. Both NOAEL and LOAEL TRVs were selected. For PCBs and mercury, available peer-reviewed toxicity data were reviewed to develop avian and mammalian TRVs. For the remaining seven metals, TRVs were selected primarily from the datasets compiled for development of USEPA Ecological Soil Screening Levels (EcoSSLs; USEPA 2005 and 2007). The development of avian and mammalian TRVs for PCBs and metals is summarized below and discussed in detail in Appendix C. The TRVs for PCBs and metals used in this SERA are summarized in Table 5-2. The development of the TRVs for dioxin-like compounds (PCDD/PCDF and DL-PCBs) is described in Appendix D.

## 5.2.1 Avian TRVs

Available toxicity data for all species were considered initially. However, specifically for PCBs, based on all of the avian toxicity data reviewed, studies conducted with domestic chickens (*Gallus domesticus*) appear to represent the high end of the sensitivity range for PCB toxicity. A significant body of research has been conducted regarding avian sensitivity to aryl hydrocarbon receptor (AHR)-mediated effects of dioxin-like compounds (DLCs). AHR-mediated effects are the primary mechanism of



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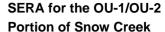
toxicity for PCBs in vertebrate species (Okey 2007). While non-AHR-mediated effects can occur, they are thought to occur at much higher concentrations than AHR-mediated effects (Giesy and Kannan 1998). Based on this research, two sets of TRVs were developed for PCBs. One represents the high end of the range of sensitivity and the second represents the mid-range of sensitivity for avian species. Additional detail on this AHR-related research and the development of the two sets of TRVs is provided in Appendix C.

Unlike PCBs, chickens do not appear to be more sensitive to mercury (Heinz et al. 2009) than other wild avian species. As such, one set of TRVs was developed for mercury and was considered applicable to all avian species evaluated. The TRVs for mercury were selected based on review of the underlying dataset for the Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife (USEPA 1995) as well as more recent literature. A detailed description of the selection of avian mercury TRVs is provided in Appendix C.

For six of the remaining seven metals (barium, chromium, cobalt, lead, manganese, nickel, and vanadium), TRVs were obtained from the dataset used to develop USEPA EcoSSLs (USEPA 2005 and 2007). Specifically, avian NOAELs were provided in the EcoSSL documents and are used herein. LOAELs were not selected for the purposes of the development of EcoSSLs. However, the toxicity dataset was reviewed and a relevant LOAEL was selected for each metal based on this dataset. This selection of LOAELs is described in more detail in Appendix C. For barium, bird low and high TRVs were obtained from Oak Ridge National Laboratory (Sample et al. 1996).

### 5.2.2 Mammalian TRVs

The toxicity data were reviewed and mink appear to be uniquely sensitive to PCBs. Because mink are not a receptor of concern for this SERA, the toxicity data considered in development of TRVs for small mammals does not include toxicity studies conducted with mink. The mammalian PCB TRVs selected represent the lowest toxicity thresholds for relevant endpoints and non-mink species found in the literature. For mercury, as for birds, the Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife (USEPA 1995) was reviewed along with other studies from the peer reviewed literature. For the remaining seven metals (barium, chromium, cobalt, lead, manganese, nickel, and vanadium), TRVs were obtained from the dataset used to develop USEPA EcoSSLs (USEPA 2005 and 2007) as described above for birds and in Appendix C.





#### 6. OU-1/OU-2 Risk Characterization

The risk characterization for this SERA is based on comparison of receptor-specific benchmarks/toxicity values or SSRBCs (calculation described below in Section 6.1) to measured COPC concentrations in sediments within the OU-1/OU-2 portion of Snow Creek. While the exceedance of toxicity value or SSRBC at an individual sample point does not necessarily indicate potential risk to a receptor or a local population of receptors, this initial comparison is considered along with OU-1/OU-2- and receptor-specific habitat information to formulate conclusions about risk to the identified receptors.

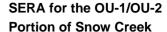
The first part of the risk characterization is the risk description (Section 6.1), which provides the quantitative results of the toxicity value and SSRBC comparisons. The second part is the habitat evaluation (Section 6.2), which provides a discussion of some of the key habitat and prey needs of each receptor relative to what has been observed or is expected within the SERA site area. Section 6.3 discusses key uncertainties that affect risk estimations, and risk conclusions are presented in Section 6.4.

## 6.1 Risk Description

This section describes the results of the quantitative risk estimates for each AE. The AEs and associated representative receptors evaluated include:

- Survival, growth, and reproduction of benthic communities
- Survival, growth, and reproduction of aquatic feeding birds (mallard, tree swallow, pied-billed grebe, and spotted sandpiper)
- Survival, growth, and reproduction of aquatic feeding mammals (muskrat, little brown bat, and raccoon)

The results of this SERA do not attempt to provide a quantitative assessment of how the magnitude and spatial extent of potential adverse effects could affect local populations. This issue along with the other identified uncertainties will be considered as part of the risk management activities of the FS process.





## 6.1.1 Site-Specific Risk-Based Concentration Calculation

Site-specific risk-based concentrations were calculated for each avian and mammalian receptor to facilitate the evaluation of the magnitude and spatial extent of potential risk. The SSRBC calculations for each receptor and COPC are shown in Tables 6-1 and 6-2 for avian and mammalian receptors respectively. The approach and methods for calculating the TEQ-based SSRBCs are provided in Appendix D. The development of the SSRBC for benthic invertebrates for PCBs is discussed in Section 5.2 and Appendix B. The SSRBC calculation for birds and mammals uses the dose equation described in Section 4.3. The dose is set equal to the TRV, and the equation is rearranged to solve for  $C_{\text{sediment}}$ . Specifically, the SSRBC calculation is shown in Equation 3:

## Where:

SSRBC = Site-specific risk-based concentration (Table 6-3)

TRV = Dietary TRV for avian- or mammalian-specified receptor

(Table 5-2)

BAF = BAF of the kth food type (see Table 4-1)

DF<sub>k</sub> = Dietary fraction of intake of the kth food type or sediment

(Tables 4-2 and 4-3)

NIR = Normalized dw ingestion rate (Table 4-2 and 4-3)

n = Number of food types

## 6.1.2 Interpretation of SSRBC Comparisons

Because the SSRBCs are calculated based on the dose being equal to a protective toxicity threshold (i.e., the NOAEL or LOAEL TRV), a sediment concentration that is less than or equal to the specified NOAEL SSRBC is considered to indicate no unacceptable risk. This determination is based on the compounded conservative assumptions used in the exposure model (e.g., high estimates for exposure parameters such as ingestion rate and assumption of 100% site use) and the conservative nature of the NOAEL TRVs. Specifically, the NOAEL is a level at which



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no adverse effects have been observed in toxicity studies. The NOAELs selected are generally the highest NOAEL that is below the lowest LOAEL from the body of toxicity literature evaluated (see Appendix C). Thus, when hazard quotients (HQs) based on NOAELs are less than 1.0, the likelihood of adverse effects occurring at these concentrations is considered *de minimus*<sup>4</sup>, and no unacceptable risk is expected. When the NOAEL HQs are greater than 1.0 but the LOAEL HQs are less than 1.0, ecologically significant adverse effects to that receptor are also uncertain, as concentrations have not reached the threshold at which effects are observed. However, there is uncertainty associated with defining the true toxicity threshold, so adverse effects are considered possible in this case, and the results are reviewed in the context of other supporting information. Likewise, a LOAEL TRV-based HQ greater than 1.0 indicates potential for adverse effects, and both the NOAEL- and LOAEL-based HQs and their associated uncertainties are evaluated with other supporting information.

## 6.1.3 Benchmark/Toxicity Value and SSRBC Comparisons

The benchmark/toxicity values and SSRBCs for PCBs and metals are summarized in Table 6-3, and the percent of individual sample points exceeding these values are shown in Table 6-4. The 95% UCL EPCs were also compared to each benchmark/toxicity value and SSRBC, and exceedances are shown in blue highlighted cells in Table 6-4. Note that the data used to calculate the 95% UCL EPCs were collected using sampling designs that focused on the upstream areas near the confluence of the 11<sup>th</sup> Street Ditch and Snow Creek and the culverts that convey Snow Creek flow under Highway 202. These locations were selected for sampling during multiple programs based on the potential for high PCB concentrations to be present. The elevated PCB concentrations in this portion of the creek reflect proximity to the Facility via surface water flow from the 11<sup>th</sup> Street Ditch and that the Highway 202 culverts tend to retain sediment (i.e., are generally depositional areas). Based on these factors, the estimated UCL of the mean for the OU-1/OU-2 portion of Snow Creek as a whole, is biased high. Given this bias, it is important to compare the measured concentrations in individual sample results to the benchmarks/toxicity values and SSRBCs, especially downstream of the highway 202 culverts.

The SSRBC comparisons with TEQ are provided in Appendix D. For sample location S-LOW-1, the TEQ concentrations in OU-1/OU-2 sediments (inclusive of

<sup>&</sup>lt;sup>4</sup> De minimus risk is defined as negligible or not of societal concern (National Library of Medicine <u>Toxicology</u> <u>Glossary - Risk De minimis</u> Retrieved on August 11, 2011).



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PCDDs/PCDFs and DL-PCBs) are below the lowest TEQ-based SSRBC for birds or mammals (i.e., based on NOAEL for the tree swallow and little brown bat respectively), except for those cases where one half the sample reporting limit is used as a substitute for non-detected values are used in the TEQ calculation.

For sample S-MED-1, the SSRBC value was exceeded by a factor of approximately 2 for the little brown bat expect for where one half of the reporting limit was used for non-detected PCB congener concentration values. When one half of the reporting limit was used for the non-detect PCB concentration values, the mammalian TEQ (inclusive of PCDDs/PCDFs and DL-PCBs) exceeded the SSRBC for the little brown, the muskrat and the raccoon. Likewise, for birds, the calculated TEQ value (inclusive of PCDDs/PCDFs and DL-PCBs) for sample S-MED-1 exceeded the SSRBC for the tree swallow but not the duck, sandpiper or grebe.

The impact of including non-detected PCB congeners in the TEQ estimate at one half of the reporting limit is illustrated for sample S-MED-1 where the estimated concentration of a single congener (PCB 126) at one half the reporting limit accounts for 75 percent of the estimated TEQ for mammals. The TEQ exceedances noted above are also in driven in part by the PCB emergent insect BAF that was used as a surrogate for PCDD/PCDFs in the TEQ SSRBC calculations (Appendix D). The uncertainties associated with this BAF are discussed in Section 6.3.2 of this OU-1/OU-2 SERA.

For benthic invertebrates, the 95% UCL concentration for PCBs exceeded the EC0\* and the EC20\* for the most sensitive endpoint and species tested in the site specific toxicity tests (i.e., H. Azteca 42-d young/female normalized to 42-d survival), with 47 and 74 percent of samples exceeding these values respectively. By comparison, using non-site-specific screening values (i.e., TECs and PECs - Table 5-1), the 95% UCL as well as all but two individual sample points exceed these values. For metals, no SSRBCs were developed. As such, other available, non-site-specific screening benchmark values (primarily TECs and PECs) are used for this comparison. For cobalt, only a single sample exceeded the TEC value, thus risk to benthic invertebrates from cobalt is considered de minimus. The 95% UCL concentrations did not exceed the PEC for mercury, and only 1 individual sample (S-2-03a) exceeded this value. Similarly, for lead, the 95% UCL slightly exceeded the PEC, but only one individual sample (CA-25-EPA-43166-2503) exceeded this value. Based on this comparison, risk to benthic invertebrate communities from lead is expected to be low. The 95% UCL concentrations of chromium and nickel as well as 25 to 33% of individual sample points exceeded the PEC values. Thus, risk to benthic invertebrate communities from these



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COPCs is possible. For barium, manganese, and vanadium, no benchmarks, toxicity values or SSRBCs are available and risk to benthic invertebrate communities from these COPCs is uncertain.

For birds, the 95% UCL concentration is below the SSRBC for cobalt (Table 6-4). Likewise, there were infrequent or no individual sample points exceeding SSRBCs (either 0 or 1 out of 12 samples depending on the species), indicating risk to birds from cobalt is de minimus. Similarly, possible risk to birds from barium appears to be minimal as the 95% UCL concentration is below the LOAEL SSRBC and only 1 individual sample exceeded this value (s-med-1). For the remaining COPCs, 95% UCL concentrations exceed NOAEL and LOAEL SSRBCs for at least one of the avian representative receptors. The tree swallow and spotted sandpiper indicated the highest possible risk for PCBs and chromium. The sandpiper indicated the highest possible risk for four of the remaining COPCs (lead, manganese, mercury, and vanadium), and the tree swallow indicated the highest possible risk from nickel. Risk from PCBs to high sensitivity avian species appears to be highest followed by risk to insectivorous birds from chromium (represented by the tree swallow) and invertivorous birds (represented by the sandpiper) from manganese and lead. Risk to avian species from mercury and nickel appears to be low with 95% UCL concentrations only slightly exceeding LOAEL SSRBCs for the tree swallow and sandpiper and infrequent individual sample point exceedances (0-3 samples).

In addition to the SSRBC comparisons based on the field bioaccumulation data described above, for PCBs, a second scenario was evaluated. In this scenario, the laboratory bioaccumulation study results were used to estimate PCB uptake into benthic invertebrate tissue. The regression analysis of the laboratory data is provided in Appendix A. The laboratory study predicted substantially higher PCB uptake into benthic invertebrates compared to the field data. Thus the resulting SSRBCs were lower. Using the laboratory uptake estimate, all samples exceeded both NOAEL and LOAEL SSRBCs for the sandpiper (i.e., the receptor with the highest proportion of benthic invertebrates in the diet). Table 6-5 presents the alternative SSRBCs as well as the percent of samples that exceed each value.

For mammals, 95% UCL concentrations are below SSRBCs for barium, cobalt, mercury, and vanadium (Table 6-4). Likewise, there were infrequent or no individual sample points exceeding SSRBCs (either 0 or 1 out of 12 samples depending on the species), indicating risk to mammals from these COPCs is *de minimus*. The 95% UCL concentrations exceed NOAEL and LOAEL SSRBCs for PCBs, chromium, manganese, and nickel. The 95% UCL concentration for lead does not exceed the



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LOAEL SSRBC. For lead, the muskrat indicates possible risk, but only a single sample exceeds the NOAEL or LOAEL SSRBCs (CA-25-EPA-43166-2503). Thus risk from lead to mammals is considered *de minimus*. The bat indicates the highest possible risk from exposure to chromium, nickel, and PCBs with all concentrations of chromium, 88% of PCB concentrations and 42% of nickel concentrations exceeding LOAEL SSRBCs. The muskrat indicates the highest possible risk from manganese with 100% of the samples exceeding the LOAEL SSRBC.

## 6.2 Habitat Quality for Receptor Species

In interpreting the individual exceedances of SSRBCs and what that may mean to the AEs being evaluated in this SERA (i.e., protection of local communities or populations), it is important to understand the habitat quality within the SERA site area. The habitat quality has a large influence on the numbers and types of receptors that may be present. The habitat and prey needs of each of the receptors evaluated in this SERA are discussed below so that the comparisons to SSRBCs can be interpreted in this context. The receptor species evaluated for risk to PCBs and metals in this OU-1/OU-2 SERA include the mallard, tree swallow, spotted sandpiper, pied-billed grebe, muskrat, little brown bat, and raccoon. The habitat quality was evaluated for each of these species on Snow Creek to determine if many individuals of each species (and guild they represent) are likely to be exposed to COPCs in sediment.

### 6.2.1 Mallard

The mallard, a dabbling duck, is a winter resident in the area that likely forages on Snow Creek (Drilling et al. 2002). This species is mainly an herbivore in the winter and has a high tolerance for humans and urban areas. It can feed in nearby agricultural areas as well as on vegetation in the creek. Fragmented habitat in an urban area is not optimum for this species, but this species and possibly other herbivorous dabbling duck species wintering in the area may be more exposed than many of the other bird species.

#### 6.2.2 Tree Swallow

The tree swallow has been observed foraging and nesting near Snow Creek (Section 2.1; Table 2-3). The tree swallow forages on aerial insects, including aquatic species hatching from the creek, and nests in cavities in trees, stumps, or rocks (Winkler et al. 2011). In such an urban area with fragments of narrow corridors of trees along the creek and a low habitat quality index (Modified KP of 1 to 3.75 in northern reach and 3



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to 5 in southern reach of creek, where optimum score is 10; see Table 2-2), natural cavities are more limited than in non-urban forests. Density of tree swallows and the receptor group they represent are expected to be low, but some individuals establishing territories in the area may be exposed, particularly in the southern section where habitat quality is higher.

### 6.2.3 Spotted Sandpiper

The spotted sandpiper does not breed or winter on Snow Creek, according to the geographic range map in Oring et al. (1997). It migrates through the area, but the urbanized Snow Creek is not likely to be a highly desirable stopover point because more attractive, undeveloped water bodies are nearby. This bird forages mostly in open habitat and prefers sandy or firm substrates, such as sandbars in creeks. Such sandbars are more common in the northern-most half mile and southern-most mile of the creek. Between these areas there are few sediment deposits (BBL 2003). While the sandpiper may be a transient visitor to this area, it is unlikely that there is substantial exposure to COPCs in Snow Creek for this invertivorous species or the receptor group it represents that feed on sandbars and requires open, non-mowed habitat for nesting.

## 6.2.4 Pied-Billed Grebe

The pied-billed grebe, a diving bird, can be a year-round resident or migrant from the north wintering in the region but requires specialized habitat typically on lakes and ponds. If using riparian areas, the pied-billed grebe requires non-moving, open water to forage and breed such as still bays and sloughs at least 0.2 hectare in size (Muller and Storer 1999). The bird requires emergent wetland vegetation for nesting in water depths of 0.8 meter. Such open, non-flowing habitat is very limited on Snow Creek. Likely, pied-billed grebes and diving ducks that would feed on the creek's invertebrates are rare in the area and, thus, little exposed. Pied-billed grebes and ducks were not observed during the field surveys conducted (see Table 2-3).

### 6.2.5 Muskrat

Muskrats have been observed foraging and denning on Snow Creek (BBL 2005). This semi-aquatic species is primarily herbivorous and prefers waters with dense emergent vegetation neighbored by upland herbaceous vegetation or agricultural fields (Allen and Hoffman 1984). It feeds on aquatic plants and agricultural crops, if crops are in its home range. Lodges (conical vegetation structures) and dens (bank burrows) are built



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within a few feet of still or slow-flowing surface waters, in depths of 0.6 to 1.3 feet. Availability of steep enough dirt banks for dens or plants to build lodges in the water are more limited on an urban creek with fragmented vegetation patches and disturbed (sometimes concrete) banks than less developed creeks. Some individuals of muskrats may be exposed.

### 6.2.6 Little Brown Bat

The little brown bat forages at dusk on aerial insects, following a flight path over water (Alabama Department of Conservation and Natural Resources [ADCNR] 2013) and potentially could forage along Snow Creek. They feed mostly on the insect orders Diptera, Lepidoptera, Coleoptera, Trichoptera, Ephemeroptera, and Neuroptera in proportion to availability of these orders (Kunz and Reichard 2010). Overall, insect production is low within the OU-1/OU-2 portion of Snow Creek (compared to OU-4), particularly in the southern half of the creek and low in some of the aquatic orders at many of the stations sampled (Ephemeroptera, Trichoptera, Neuroptera; SLERA Tables 10-14 [BBL 2005]). Low insect production not only lowers the density of bats that can be supported, but also decreases attraction of bats to the creek because they focus on areas with high insect concentrations (Kunz et al. 2011). The high percentage of the urban creek that supports little sediment or aquatic habitat (Figure 2-1) probably accounts for much of the low production of insects.

Other habitat requirements of the little brown bat include: (1) caves for hibernating, which can be up to 200 miles from their summer foraging area; (2) maternity roosts, which support hundreds of females and are typically in warm dark places such as attics barns, or tree cavities; and (3) roosts for non-reproductive females and males, which are typically in tree cavities, underneath rocks, in piles of wood, crevices, human structures, and occasionally caves. None of these features are likely to be limiting for bats inhabiting the Snow Creek area. However, although possible, it is highly unlikely little brown bats are foraging along Snow Creek because this species is rare in Alabama (ADCNR 2013). Extensive netting and cave surveys throughout Alabama in the past 15 years have yielded no observations, and it was rare in caves in Alabama in 1965 (Kunz and Reichard 2010). Alabama is south of the core geographic range of this species. However, other bat species represented in the guild of the little brown bat (e.g. eastern pipistrelle and big brown bat) are common in Alabama, though probably still uncommon on a creek with low insect production. Thus, exposure of bats to COPCs in OU-1/OU-2 sediments is likely limited.



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### 6.2.7 Raccoon

Raccoons are nocturnal and dormant in dens during the day. Although not observed during field surveys in the day, they may be present on Snow Creek. Raccoons are omnivorous and opportunistic feeders and well adapted to life in urban as well as more natural settings (SIBR 2013) if a permanent water source is nearby. Foraging habitat includes riparian and other wetlands, forest, and shrub cover (SIBR 2013). Raccoons are commonly found along waterways (Tennessee Wildlife Resources Agency [TWRA] 2013). Raccoons may be attracted to urban/suburban areas where scavenging opportunities and cover are abundant. Raccoons have daily nest sites, often used in mild weather, but will also den in tree cavities, snags, logs, rocks, abandoned buildings, or dense vegetation. Individual raccoons living along Snow Creek may be exposed.

### 6.2.8 Habitat Summary

Based on the habitat analysis provided above, it is unlikely that avian or mammalian exposures within the OU-1/OU-2 portion of Snow Creek could result in population-level effects, simply due to the low numbers of individuals likely present or feeding significantly in this area. Of the receptors considered in this SERA, individual mallards, tree swallows, muskrats, and raccoons are considered to have the highest probability of exposure. These findings are considered below in the discussion of the comparison to SSRBCs for each AE.

### 6.3 Uncertainty Analysis

There are a number of uncertainties that affect risk predictions in this SERA. This section focuses on those uncertainties that may result in significant over- or underestimation of possible risk. These sources of uncertainty are generally associated with receptor exposure assumptions, BAFs, TRVs, and benchmarks. Specific uncertainties and how they may result in over- or underestimation or risk are discussed below.

## 6.3.1 Exposure Assumptions

Exposure assumptions with the greatest uncertainty are associated with receptor site use (i.e., are the receptors present for a significant amount of time and is the prey base sufficient to support their long-term dietary needs) and receptor exposure models. Each of these is discussed in the following sections.



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### 6.3.1.1 Habitat Quality/Food Availability

As discussed in Section 2.1, the quality of the habitat in this urbanized portion of Snow Creek is not optimal for ecological receptors. The detailed discussion of receptor habitat use provided above demonstrates that the evaluation of each of the receptors in this SERA with the assumption of 100% site use likely overstates exposure. However, it is acknowledged that the OU-1/OU-2 portion of Snow Creek is adjacent to more optimal habitat within OU-4. As such, the overall exposure to ecological receptors that may have exposure from both areas is unknown. It is anticipated that the OU-4 BERA will fully evaluate ecological receptor exposure in these downstream areas.

### 6.3.1.2 Receptor Use

Most of the receptors that are assumed in this SERA to be using the OU-1/OU-2 site area continuously (i.e., 100% site use) are likely transient and are not expected to spend 100% of their time in the site area. For example, the federally endangered gray bat (*Myotis grisescens*) could potentially forage in Snow Creek. It requires continuous cover while foraging and while traveling to and from its foraging habitats. Tree and shrub canopy is probably limited for most areas of Snow Creek; therefore, it may be a transient receptor within the OU-1/OU-2 portion of Snow Creek. Likewise, as discussed above, the sandpiper is migratory and would be expected to use the OU-1/OU-2 site area only as a stop-over. Because the habitat and the prey base within the site area is limited and other more optimal water bodies are nearby, it is unlikely that this and other invertivores species would preferentially use the OU-1/OU-2 portion of Snow Creek.

## 6.3.1.3 Receptor Exposure Inputs

For avian and mammalian receptors, exposure is estimated using a dietary exposure model. This model uses generic assumptions for FIR, BW, and dietary composition. Each of these can affect the resulting SSRBC that is calculated. All elements were selected to be conservatively representative of the species evaluated and could over or under estimate potential exposure. In selecting representative receptors, the mallard and the muskrat were selected to represent the herbivorous feeding guild. However, considering the lack of substantial aquatic vegetation present within the OU-1/OU-2 site area, alternative diets are considered for these receptors. Specifically, alternative dose estimates were calculated for the mallard and the muskrat, assuming an omnivorous diet. All other elements of the exposure model remained the same as



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those described in Sections 4.3 and 4.4. For this alternative analysis, the mallard dietary composition was based on breeding mallards diet that was available from the USEPA Wildlife Exposure Factors Handbook (USEPA 1983). Adjusting this diet slightly to be consistent with prey tissue estimates available for the OU-1/OU-2 portion of Snow Creek, the breeding diet of the mallard is assumed to consist of 26% aquatic emergent insects, 25% mollusks, 15% crayfish, and 34% plants. Likewise, muskrats have been observed to opportunistically adjust their diets when aquatic vegetation is not prevalent (Neeves and Odom 1989). While this study does not provide a specific percent of mollusks in the diet of muskrats, it does indicate that muskrats in streams and canals can adopt an omnivorous diet which may include Asiatic clams if abundant. To evaluate this possibility, a muskrat diet of 20% mollusks, 5% benthic invertebrates, and 75% aquatic vegetation was evaluated.

The results of using these alternative diets indicate that for PCBs, chromium, and nickel, SSRBCs would be lower (between approximately 50% for PCBs and 30% for chromium). For barium and manganese, SSRBCs would be higher based on these alternative assumptions (15% and 100%, respectively). Table 6-6 summarizes these alternative SSRBCs in comparison to the values calculated using the assumptions discussed in Section 4 of this SERA (i.e., the herbivorous dietary scenario). The primary reason for the large change in SSRBCs is based on the influence of the tissue specific BAFs employed. For example, the plant BAF for manganese is 4.4 and the mollusk BAF for manganese is 1.1 (Table 4-1). Because the relative proportion of mollusk in the mallard diet went up and the plant proportion went down, the overall result was that a lower exposure would be indicated, making a higher SSRBC protective of mallards based on this diet. Similarly, for PCBs, the plant BAF is 0.42 compared to the mollusk BAF of 6.5. The higher proportion of mollusk in the diet relative to plants results in a higher estimate of exposure and a lower SSRBC for protection of mallards eating an omnivorous diet. Uncertainty associated with BAFs is evaluated below and in Appendix A.

### 6.3.2 Bioaccumulation Factors

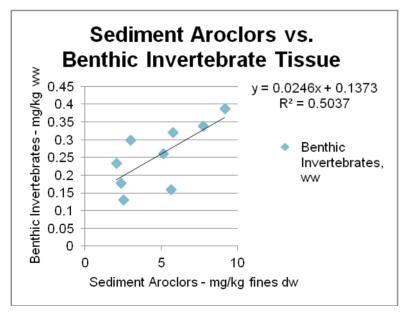
Because specific biological data were not available for OU-1/OU-2 and, therefore, prey tissue concentrations were not measured in OU-1/OU-2, it was necessary to model prey tissue concentrations using an uptake model based on biological data collected in OU-4. The BAF is used to estimate prey tissue concentrations that may be consumed by the representative birds and mammals evaluated in this SERA. Specifically, the BAF represents the relationship between abiotic media (in this case sediment) and various prey tissues (e.g., plants, benthic invertebrates, etc). For PCBs and mercury,



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the model was based on a large dataset collected within OU-4. While having this large dataset may decrease some of the uncertainty associated with the model, a good deal of uncertainty remains because predictive relationships were generally not found between sediment and prev tissue for either constituent. A detailed correlation analysis was conducted with the dataset for PCBs and mercury (Appendix A). This analysis resulted in significant relationships between fines normalized sediment and PCBs in benthic invertebrates and mercury in frogs on a wet weight basis. As discussed in Section 4.3.1, none of the other tissue types being consumed by receptors showed a positive correlation with fines normalized PCB or mercury concentrations in sediment. In addition, percent fines in sediment did not correlate well with PCB or mercury concentrations in sediment. Thus, it was not possible to estimate a concentration for any other tissue type based on fines normalized sediment. Because no other element of the diet is based on percent fines and because the calculation of an SSRBC requires a static assumption about the percent of fines in sediment, it was not feasible to incorporate these fines normalized relationship into the overall dose estimation for SSRBC calculation. To evaluate this uncertainty, an SSRBC was calculated using the benthic invertebrate PCB regression shown below.

Figure 6-1. Regression Analysis of Fines Normalized tPCB Concentrations in Sediment and Field Collected Benthic Invertebrate Tissue



To use this relationship in the dose model, it was necessary to convert the fines normalized sediment concentration into a dry weight PCB concentration using the



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average percent fines for all BSA data of 36.4%. It was also necessary to convert the estimate tissue to a dry weight value to be consistent with the dry weight ingestion rate used in the dose model. The average percent solids of 18.5% (83.5% moisture) was used for this purpose. The resulting SSRBC based on this static assumption for fines would be increased by approximately 25% based on the sandpiper (i.e., the receptor with the highest proportion of benthic invertebrates in the diet). Specifically, the SSRBC based on the median BAF of 0.92 for benthic invertebrates results in a LOAEL SSRBC of 8.1 mg/kg dw sediment and the SSRBC calculated using the regression equation and assumptions shown above results in an SSRBC of 10.8 mg/kg dw.

Based on the lack of a usable correlation discussed above, a ratio estimator that represents the central tendency of the dataset was selected. Because individual samples of the various prey tissues were not co-located with individual sediment locations, mean sediment and tissue concentrations were calculated for each BSA to maintain some degree of co-occurrence. Field notes were reviewed to determine if specific tissue collection locations could be estimated. While general collection areas were identified, specific tissue samples could not be associated with the individual collection locations, so additional analysis of spatial correlation was not conducted. The ratio of means for each BSA was calculated and, consistent with the approach used for BAF selection in the EcoSSL Guidance (USEPA 2005), the median BAF was selected as the most appropriate estimate of central tendency for the range of BAFs. To further evaluate the predictiveness of these BAFs, figures 4-1 and 4-2 present the individual tissue concentrations for each BSA relative to the mean sediment concentration for that BSA. The BAF line (in green) is plotted to demonstrate how predicted concentrations relate to measured tissue concentrations. Non-detected values are shown as open symbols and as shown on these figures, the non-detects do not appear to result in BAFs that underestimate central tendency. As shown on these figures, the median BAF generally results in a good prediction of the central tendency of the measured tissue concentrations. One exception appears to be for PCBs in emergent insects. In this case, crane flies in two BSAs (EUA-02 and EUA-03) contained substantially higher PCB concentrations than those collected at EMA-02 (craneflies plotted as squares on Figure 4-1) and damselflies collected in other BSAs. The selected BAF for emergent insects may underestimate uptake for crane flies.

To better understand this uncertainty and the disparity between concentrations, natural history of the orders collected were reviewed. There are thousands of species of crane flies, dragonflies, and damselflies, but in general, crane flies primarily feed on vegetation and algal and microscopic organisms low in the food chain. They can also feed and reside in both aquatic and terrestrial environments. This is in contrast to



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odonates, which are mainly predaceous and prey upon various trophic levels within the food chain throughout their nymph development stage and on insects in their adult stage. This information is not consistent with the observed concentrations, as species feeding lower in the foodchain (e.g., on plant matter) would not be expected to be exposed to higher PCB concentrations than species that are predators. Because some species of crane flies can be terrestrial, a possible connection between the crane flies and the riparian soil adjacent to EUA-02 and EUA-03 was considered. Calculating a mean soil concentration and comparing that to the tissue concentrations in these areas results in BAFs that are more consistent with what was observed in other samples, but the BAFs are still relatively high (e.g., 1.4 and 1.8 for crane flies only compared to 0.3 to 0.8 for mixed species). Based on the feeding strategy for crane flies, it would seem unlikely that the sediment in EUA-02 and EUA-03 is the source of the elevated PCB concentrations measured. Comparing the crane fly results to those observed at another PCB River site (i.e., the Kalamazoo River), indicates that the BAFs for dipteran species are very consistent with the BAFs observed for mixed species in this OU-1/OU-2 SERA (e.g., on a wet weight basis, mean OU-4 BAF = 0.17 and mean Kalamazoo BAF for all emergent insects = 0.18). This further supports that the six crane fly samples collected within EUA-02 and EUA-03 may not be appropriately representative of aquatic emergent insects. However, the selected BAF is intended to represent uptake across a range of insects and it is recognized that upper trophic level receptors do not differentiate between aquatic and terrestrial insects when feeding. Given that the crane fly PCB data are uncertain, the selected BAF may over- or underestimate potential uptake for these species...

To further evaluate the predicted median BAFs based on the OU-4 data, BAFs available for two other PCB sites were considered. For the Kalamazoo River (Kay et al. 2005) and the Housatonic River (ARCADIS 2008) biota-sediment accumulation factors (BSAFs) were available for several of the biotic tissues considered in this SERA. Specifically crayfish BSAFs were available from both sources and are used here for comparison. For the Kalamazoo calculated BSAFs were based on the geometric mean of lipid-normalized wet weight biota total PCBs to the geometric mean of OC-normalized dry weight sediment total PCBs. For the Housatonic River, BSAFs were based on averaged OC-normalized PCBs in river sediment by sediment mile and co-located lipid normalized crayfish tissue concentrations. The higher of the median or geometric mean of the individual BSAFs was used, and in the case of crayfish, the geometric mean of the individual BSAF was used. The Kalamazoo River data resulted in a crayfish BSAF of 0.429 kg organic carbon (oc)/kg lipid (Kay et al., 2005) and the Housatonic River data resulted in a crayfish BSAF of 0.56 kg oc/kg lipid for Reach 5A/5B and a crayfish BSAF of 1.23 kg oc/kg lipid for Reach 5C/5D/6 (ARCADIS 2008).



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The crayfish BSAF in the SERA is calculated as 0.31 kg oc/kg lipid based on the median BSAF of the tissue to sediment ratios (Table A-9 in Appendix A).

It is important to note that no predictive relationships were found between tissue and sediment for either the Housatonic River or the Kalamazoo River datasets and both values are based on selecting a predictor of central tendency. This comparison indicates that the Site-specific values developed for this SERA are generally in the range of those observed for other sites and are preferred because they are based on Site-specific data. While there is some uncertainty regarding the application of data collected from OU-4 to OU-1/OU-2, this uncertainty is considered relatively small compared to application of non-site specific factors. Because BAFs are used in conjunction with a number of other conservative (tending to overestimate) assumptions (i.e., ingestion rates, sediment estimates, site use, and TRVs), the use of median BAFs is not expected to result in overall underestimation of exposure.

Additional uncertainty results from the fact that sediment data from individual BSAs were measured as sum of Aroclors, and some tissue was measured as the sum of homologs (i.e., plants, benthic invertebrates, emergent insects, reptiles, and amphibians). This mixing of Aroclor and homolog data adds some uncertainty to the BAFs and the resulting SSRBCs. Because measured homolog tissue concentrations are generally higher than those measured as Aroclors (i.e., Site specific benthic invertebrate data indicate that homologs overestimate Aroclor concentrations by a factor of 2 to 4), tissues measured as homologs are expected to overestimate uptake compared to Aroclors. Because the BAFs are used to calculate safe sediment concentrations and the sediment concentrations are based on Aroclors, the resulting SSRBCs are likely to be biased low when based on homolog data.

As discussed in Section 4.3.1, bioaccumulation for benthic invertebrates was also measured in a laboratory study conducted with OU-4 and reference sediment and *lumbriculus verigatus*. The resulting laboratory study predicts uptake of PCBs from sediment at approximately 26 times that of what was observed based on the field collected invertebrates. The specific reasons for the differences in the laboratory and field estimates may result from differences in sediment composition, but the field data were evaluated based on organic carbon and fines normalized sediment and neither of these factors substantially changed the general uptake estimates. Another factor that may influence differences is the fact that the field and laboratory data are based on different species. The worms used in the laboratory analysis are generally adult forms, are infauna and live and feed primarily in the sediment matrix. The field collected invertebrates (odonates) are larval form and live on the surface of the sediment during



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this life stage and likely have lesser exposure than worms. A benthic feeding receptor likely eats some combination of a variety of invertebrates so the use of this lab-based uptake relationship may over estimate exposure as its use assumes all invertebrates consumed are worms.

### 6.3.3 Toxicity Benchmarks and Reference Values

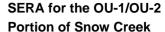
The toxicity benchmarks and TRVs used in this SERA to identify possible risk to each AE represent one of the largest sources of uncertainty in the SERA. In all cases, the benchmarks and TRVs are selected to be conservative estimators of a toxicity threshold so that the possibility of underestimating risk is minimized. The specific uncertainties for these values are discussed below.

### 6.3.3.1 PCB Sediment Toxicity Values

Uncertainty in the sediment-toxicity values (EC0\*, EC10\*, EC20\*, and EC50\* values) has five components: (1) whether the reference sediments collected in areas that are located upstream of the Site reflect background chemical constituents that are not associated with P/S (i.e. urban runoff from the Snow Creek watershed); (2) whether the lowest measured reference-sediment response for a given toxicity endpoint adequately represents the lowest response that would be caused by a reference sediment; (3) variability in the calculated EC0\*, EC10\*, EC20\*, and EC50\* values; (4) inherent variability in results of toxicity tests; and (5) potential variability between batches of toxicity tests conducted at different times and in different laboratories a considerable length of time after the sediments were collected from OU-4. These five potential sources of uncertainty are discussed below.

Regarding the first uncertainty, the six reference sediments collected from Choccolocco Creek approximately 3 kilometers upstream of its confluence with Snow Creek came from an agricultural area that does not receive urban inputs. Therefore, the reference sediments do not have physical-chemical characteristics of an urban-influenced stream (Snow Creek) and might underestimate the toxicity caused by chemicals that originated from non-Site sources, thus, overestimating the toxicity caused by inputs originating from the Site.

Regarding the second uncertainty, only six reference sediments might not adequately represent the entire range of potential reference-sediment responses, even if the reference sediments contained appropriate background chemicals and toxicity from non-Site sources. Therefore, the lowest reference-sediment response for a given





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toxicity endpoint might not be representative of the "true" lower limit of the reference values, contributing to a potential underestimate or overestimate of the toxicity caused by inputs originating from the Site.

Regarding the third uncertainty, there is variability in the responses of the OU-4 sediments around the central-tendency concentration-response curves for each endpoint (see Figures B-3 and B-4 in Appendix B). Furthermore, there is variability in the toxicity responses for repeated testing of a given sediment (see Appendix B and below). Therefore, there is statistical uncertainty in the EC0\*, EC10\*, EC20\*, and EC50\* values listed in Table B-1 (Appendix B).

Regarding the fourth uncertainty, results of sediment toxicity tests can be highly variable for some endpoints, even when conducted in the highly-skilled laboratories that conducted the tests with OU-4 sediments (Appendix B). For example, the OU-4 tests were conducted in three batches, each with its own control sediment (but the same sediment was used as a control in all three batches). The variation among the three control responses for the 23 endpoints ranged from 1.3% to 137% of the mean of the three results (Appendix B). In general, survival and hatch-percentage endpoints varied by relatively small percentages (1.3 to 4.4%), growth endpoints varied by intermediate percentages (18 to 80%), and reproduction endpoints varied by intermediate to large percentages (25 to 137%). Given this sometimes large variability in control responses for a toxicity endpoint, large variability can also be expected in responses of organisms exposed to OU-4 sediments. For example, for the one OU-4 sediment that was repeat-tested two months apart in the same laboratory, the difference in control-normalized response for the 12 endpoints ranged from 0.2% to 74% of the mean of the two results. Six (50%) of those endpoints had differences that were less than 20% of the mean control-normalized response, and five (42%) had differences between 20 and 50% of the mean control-normalized response. The median difference was 22.4%. Therefore, when comparing any one response percentage to a specified threshold for significant effects (e.g., an EC0\*, EC10\*, EC20\*, or EC50\*), it should be recognized that the "true" toxicity of that sediment might be accurately estimated, considerably underestimated, or considerably overestimated by the result from a single toxicity test. In contrast, the regression-based predictions of PCB concentrations that cause a specified percentage response are central-tendency estimates that tend to "average-out" that variability, making the regression-based predictions of effect percentages less uncertain than the results from any single sediment toxicity test.



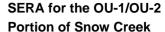
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Regarding the fifth uncertainty, the OU-4 sediments used in the toxicity tests were collected in August 2010 but were not tested until November 2010 (the first cycle of testing) or January 2011 (the second cycle of testing). Those intervening periods exceeded the maximum eight-week hold time recommended by USEPA (2000) before sediment toxicity tests should be started. During storage, the chemical characteristics of the sediments might have changed, thus altering the concentrations and/or bioavailability of the PCBs and other potential contributors to toxicity. However, those delays were decided to be necessary: (1) to provide time for chemical analyses of the sediments, so informed decisions could be made about which sediments to test in which batch, and (2) because the two contracted laboratories did not have enough capacity to conduct all the toxicity tests in one batch (i.e., a minimum two-month interval was needed between batches to allow the C. dilutus tests in the first batch to be completed before starting the second batch of tests). The extended hold times were deemed acceptable because the primary goal of the testing was to develop generic concentration-response relationships of toxicity versus PCB concentration (for extrapolation to all OU-4 sediments not only those sediments that were tested) and was not to specifically characterize the "true" toxicity of any given OU-4 sediment. Therefore, although changes in the chemistry of sediments that are stored beyond the eight-week hold time can contribute to interpretation uncertainties, the uncertainty is less when the results of the toxicity tests are used to develop concentration-response relationships (as in this application) than when they are used to decide whether a specific sediment is toxic when tested after its hold time has been exceeded (which was not the purpose of these toxicity tests).

### 6.3.3.2 TECs and PECs

Consensus-based sediment guidelines were evaluated by MacDonald et al. (2000a,b) to determine if they would be effective tools for predicting sediment quality benchmarks in freshwater ecosystems. The TEC is defined as the concentration below which adverse effects are not expected to occur, and the PEC is the concentration above which adverse effects are expected to occur. These levels were derived using an averaging approach based on similar thresholds from the following published sources:

- Effects-Level SQGs (threshold effects levels [TELs] and probable effects levels [PELs]; Smith et al. 1996)
- Hyalella azteca Effects-Level SQGs (TEL-HA28 and PEL-HA28; Ingersoll et al. 1996 and USEPA 1996)
- Effects-Range SQGs (effects range low and effect range median; Long and Morgan 1991)





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- Screening-Level Concentration SQGs (lowest effect levels and severe effect levels; Persaud et al. 1993)
- Sediment Quality Advisory Level SQGs (minimum effect thresholds, toxic effect thresholds, effects concentration and EC, MENVIQ; Environment Canada and Ministere de l'Envionnement du Quebec 1992)

Based on the evaluation criteria, TECs and PECs for most of the individual chemicals and mixtures were considered reliable as predictive tools (i.e., predictive ability was greater than 75%). This reliability was associated with the narrative intent of TECs and PECs (i.e., sediment samples were predicted not to be toxic if the measured concentration of a chemical was less than its corresponding TEC and, similarly, sediment samples were predicted to be toxic if the measured concentration of a chemical was greater than its corresponding PEC). However, MacDonald et al. (2000b) acknowledged that sediment samples with concentrations of a chemical that lie between its corresponding TEC and PEC values could not be predicted as being not toxic or toxic. Thus, the true toxicity threshold (i.e., no observed effect concentration) theoretically lies between the TEC and PEC.

There is significant uncertainty inherent in all of the approaches developed based on empirical data relationships and, consequently, compound-specific values can vary by several orders of magnitude depending on the intent of their use and the derivation procedure (MacDonald et al. 2000b; Smith et al. 1996). Empirical approaches may not reflect contaminant-specific response thresholds (due to un-addressed co-contaminant and chemical mixture issues), and they do not incorporate site-specific factors that influence bioavailability (MacDonald et al. 2000a,b; DiToro et al. 1991). For these reasons, these screening values are likely to overestimate toxicity, as demonstrated specifically with Anniston OU-4 sediments in Appendix B.

### 6.3.3.3 Avian TRVs

As discussed in Section 5, one of the primary uncertainties associated with avian PCB TRVs is determining if identified receptors might be highly sensitive to PCBs (i.e., chicken-like). For avian receptors, a large number of the available toxicity studies have been conducted using the domestic chicken and other species as the test species. Based on review of the data, the chicken appears to be substantially more sensitive to PCBs than all of the other avian species tested. As such, TRVs based on domestic chicken studies were developed to represent the high end of the range of sensitivity for all potential species. A second set of TRVs were developed to represent the midrange of sensitivity. Recent research conducted by Dr. Kennedy at the University of



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Ottawa indicates that the vast majority of wild species are not expected to be chicken-like in their sensitivity to PCBs (Farmahin et al 2012). Specifically, genetic sequence of the AHR for the spotted sandpiper, the tree swallow, and the mallard have been determined and all three species were found to be have moderate or low sensitivity to DLCs. The pied-billed grebe has not been tested, but seven duck species have been tested and all had either moderate or low sensitivity. Additional detail regarding Dr. Kennedy's research and species sensitivity to PCBs is provided in Section 5.2 and Appendix C. Thus, the mid-range sensitivity TRVs are expected to be more representative of wild birds found along the OU-1/OU-2 site area.

For development of the high-sensitivity (i.e., chicken) tPCB TRVs, a total of seven studies were evaluated. Based on the available data, the lowest LOAEL of 0.13 mg/kg-d for reduced hatchability in chickens, reported by Lillie et al. (1974) was selected. While the relevance of this endpoint to population level effects is uncertain, the LOAEL was selected for conservatism. No NOAEL was measured in this study, thus the NOAEL was extrapolated by dividing the selected LOAEL by a factor of 3. The extrapolated NOAEL of 0.043 mg/kg/day is lower than the observed NOAEL from Scott 1977 of 0.065 mg/kg/day and indicates that an extrapolation factor of 3 is conservative. These values are the lowest values from the available literature and are, therefore, likely to be conservative TRV values.

A total of nine studies were evaluated to develop mid-range sensitivity (i.e., nonchicken) tPCB TRVs. Based on the available data, the lowest LOAEL of 1.4 mg/kg-d for reduced egg production in mourning doves (Koval et al. 1987) was selected for a representative low-effect threshold for the mid-range of sensitivity. While this study was not designed to measure this endpoint and did not provide statistical evaluation of egg production, this value is similar to other observed LOAELs (e.g., study with ringnecked pheasants by Dahlgren et al. 1972: LOAEL 1.8 mg/kg) and was selected for conservatism. Because only a single unbounded NOAEL below this LOAEL was available in the literature (McLane and Hughes 1980 – 0.41 mg/kg/day), the NOAEL TRV of 0.47 mg/kg/day was extrapolated by dividing this LOAEL by a factor of three. While this may create some uncertainty surrounding the exact no-effect threshold level, this is not anticipated to underestimate risk to moderate or low sensitivity avian species because the selected NOAEL is bounded closely by the observed NOAEL and by TRVs developed for the more sensitive chicken species. Therefore, these mid-range sensitivity TRVs, including the extrapolated NOAEL, are expected to be conservative, and any uncertainty should overestimate risks to moderate or low sensitivity avian species considered in this OU-1/OU-2 SERA.



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For mercury, the primary uncertainty associated with the selected TRVs is the fact that the selected values are based on studies in which exposure was solely to methylmercury. This likely over estimates potential toxicity to identified receptors as the complete dose would not be expected to consist of methylmercury (e.g., the portion coming from incidental sediment ingestion).

### 6.3.3.4 Mammalian TRVs

For PCBs, a total of ten studies was evaluated to develop the TRV values for small mammals. Based on the available data, the lowest LOAEL of 0.68 mg/kg-d based on reduced mouse birth and weaning weight and reduced number weaned per month (McCoy et al. 1995) was selected as the representative low-effect threshold. Only one bounded NOAEL and LOAEL value was available; however, the NOAEL was higher than the TRV selected for the LOAEL. Therefore, a NOAEL TRV threshold was extrapolated by dividing this LOAEL by a factor of three. While this may create some uncertainty surrounding the exact no-effect threshold level, this is not anticipated to underestimate risk to small mammalian species, as this value is well below the other NOAEL values in the small mammal toxicity dataset considered.

For mercury, as discussed above for birds, the primary uncertainty associated with the selected TRVs is the fact that the selected values are based on studies in which exposure was solely to methylmercury.

## 6.4 Risk Findings

The findings of the risk assessment for the OU-1/OU-2 portion of Snow Creek are presented below and consider the habitat quality/connectivity and well as key uncertainties associated with the SSRBC calculations and comparisons.

## 6.4.1 Survival, Growth, and Reproduction of Benthic Invertebrate Communities

For PCBs, the comparison of the EC0\* toxicity values (i.e., the EC0\* result for the most sensitive endpoint and species from the site-specific toxicity testing) to sediment concentrations shows that 74% of the sample locations exceed this value (Table 6-4), while 47% exceeded the EC20\* (i.e., the EC20\* result for the most sensitive endpoint and species from the site-specific toxicity testing). Concentrations are generally higher in the upstream portion of the creek, near the confluence of the 11<sup>th</sup> Street Drainage Ditch and the culverts at the Highway 202 underpass. Downstream of Highway 202,



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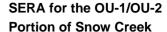
where habitat is even more fragmented, there are only five exceedances of the EC20\* toxicity value.

For metals, a number of sample locations exceeded both low and high benchmarks (Table 6-4). It is important to note that metal concentrations upstream of the 11<sup>th</sup> Street Drainage Ditch confluence with Snow Creek, and hence upstream of runoff from the plant (OU-3), also exceed benchmarks. In many cases, these upstream concentrations are higher than concentrations downstream of the 11<sup>th</sup> Street Drainage Ditch. As with PCBs, some of the highest metal concentrations are associated with samples collected in or near the culverts at the Highway 202 underpass (Figures 3-1a, 3-1b, and 3-2). This finding is more likely related to the sediment trap aspects of the culverts than a relationship between PCBs and the other constituents that could otherwise be inferred.

### 6.4.2 Protection of Local Populations of Aquatic Feeding Birds

For PCBs, the spotted sandpiper and the tree swallow indicate the highest potential for risk (i.e., had the lowest SSRBCs), followed by the pied-billed grebe and the mallard. Assuming an omnivorous diet for the mallard (Section 6.3.1.3), the mallard also indicates a similar level of risk to the sandpiper and tree swallow. Table 6-4 summarizes the number of samples that exceeded each SSRBC. The spotted sandpiper and the tree swallow are moderately sensitive species based on AHR genetic sequences (see Section 5.2). As such, the mid-range sensitivity SSRBCs apply for these species. The LOAEL SSRBCs are 1.5 and mg/kg and 3.1 mg/kg, respectively, for the tree swallow and the sandpiper. Most of the sediment samples exceed the SSRBC for the tree swallow and a little over half exceed the SSRBC for the sandpiper. The SSRBC exceedances for the sandpiper are generally near the confluence of the 11<sup>th</sup> Street Drainage Ditch and Snow Creek and the culverts at the Highway 202 underpass. There are eight exceedances of the LOAEL SSRBC downstream of the Highway 202 underpass (Figure 3-1b). The mallard and the grebe are also expected to be mid-range or low sensitivity species. The LOAEL SSRBs for these species are not exceeded downstream of the Highway 202 underpass. For any high sensitivity avian species that may be present within the OU-1/OU-2 portion of Snow Creek, the majority of samples exceed both NOAEL and LOAEL SSRBCs indicating risk from PCBs to these potential receptors if site use is high.

For metals, LOAEL SSRBCs are primarily exceeded near the confluence of the 11<sup>th</sup> Street Drainage Ditch and Snow Creek and the culverts at the Highway 202 underpass. However, three samples collected by USEPA within an industrial area of





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the OU-1/OU-2 site area indicate concentrations of several metals greater than the most conservative SSRBCs. Specifically, sample CA-25-EPA-43166-2503 contains the highest lead concentration by 5 to 10 fold and relatively high concentrations of barium, chromium, manganese and nickel. Based on the relatively low concentration of PCBs detected in this sample (0.75 mg/kg), the Site contribution to this sample is uncertain. In addition, with the exception of mercury, metals concentrations upstream of the Site are similar or greater than many concentrations measured within the OU-1/OU-2 site area and also exceed SSRBCs.

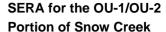
As described in Appendix D, TEQ for PCDD/DFs exceeded SSRBCs only when the full reporting limit was include for non-detected PCDD/DF congeners and these exceedances were less than a factor of 2. Total TEQ concentrations (inclusive of PCDD/DFs and DL-PCBs) in one of the two PCDD/DF samples (S-MED-1) exceeded SSRBCs for the tree swallow<sup>5</sup>, which was assumed to consume 100 percent emergent insects. The uncertainties associated with the emergent insect BAF and the use of one half reporting limit for non-detected PCB congeners are discussed in Section 6.3.2 and Appendix D, respectively.

### 6.4.3 Protection of Local Populations of Aquatic Feeding Mammals

For PCBs, the little brown bat indicated the highest potential for risk (i.e., had the lowest SSRBCs), followed by the muskrat, and lastly the raccoon. Assuming an omnivorous diet including mollusks for the muskrat, the SSRBCs are lower but still greater than those of the bat. Table 6-4 summarizes the number of samples that exceeded each SSRBC. The LOAEL SSRBCs are 1, 8, and 12 mg/kg respectively, for the bat, raccoon and muskrat. For the bat, most samples exceeded this SSRBC. For the muskrat and raccoon, as discussed above, the sediment samples that exceed these SSRBCs are generally near the confluence of the 11<sup>th</sup> Street Drainage Ditch and Snow Creek and the culverts at the Highway 202 underpass. There are three low magnitude exceedances of these SSRBCs downstream of the Highway 202 underpass (Figure 3-1b).

For barium, cobalt, mercury, and vanadium, no samples exceeded the LOAEL SSRBC for mammals. For lead, only one sample exceeded the LOAEL SSRBC. For

<sup>5</sup> Both samples exceeded SSRBCs when one half the reporting limit was substituted for non-detected PCB congener concentrations. (See appendix D).





Anniston PCB Site Anniston, Alabama

manganese and chromium, all OU-1/OU-2 site area samples exceeded the lowest LOAEL SSRBC for mammals, as did the majority of the samples upstream of the OU-1/OU-2 site area. As discussed above, this indicates that the sources of these metals may not be OU-1/OU-2 related.

TEQ for PCDD/DFs exceeded SSRBCs only when the full reporting limit was include for non-detected PCDD/DF congeners and these exceedances were less than a factor of 2. Total TEQ concentrations (inclusive of PCDD/DFs and DL-PCBs) in one of the two PCDD/DF samples (S-MED-1), exceeded SSRBCs for the little brown bat<sup>5</sup>, which was assumed to consume 100 percent emergent insects. The uncertainties associated with the emergent insect BAF and the use of one half reporting limit for non-detected PCB congeners are discussed in Section 6.3.2 and Appendix D, respectively.

### 6.4.4 Summary

In summary, risk to benthic invertebrates from exposure to PCBs and some metals in localized areas within OU-1/OU-2 portion of Snow Creek (i.e., primarily near the confluence of the 11<sup>th</sup> Street Drainage Ditch and Snow Creek and the culverts at the Highway 202 underpass) is possible. Risk to populations of avian and mammalian species that may reside or forage within this area is unlikely because habitat constraints likely limit exposure to large numbers of receptors for extended periods of time. Some risk to individual birds is possible from exposure to PCBs, chromium, lead, manganese, mercury, nickel, vanadium, and total TEQ and some risk to individual mammals is possible from exposure to PCBs, chromium, manganese, nickel, and total TEQ. These risk estimates are considered conservative and likely overstate the potential for adverse effects on local populations of receptors in the OU-1/OU-2 site area.



Anniston PCB Site Anniston, Alabama

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**Tables** 

# Table 2-1 Summary of Aquatic Habitat Assessment<sup>1</sup>

(conducted using USEPA Rapid Bioassessment Protocols)

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

Habitat Parameters - Low Gradient	Condition Category & Score <sup>2</sup> for Each Survey Location Optimal (20 - 16) Suboptimal (15 - 11) Marginal (10 - 6) Poor (5 - 0)							
Streams Reaches	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5			
Epifaunal Substrate/Available Cover	8	11	17	12	17			
Pool Substrate Characterization	14	8	7	8	4			
Pool Variability	3	4	8	11	15			
Sediment Deposition	14	12	17	14	17			
Channel Flow Status	17	17	17	17	18			
Channel Alteration	14	17	18	18	9			
Channel Sinuosity	5	6	3	4	6			
Bank Stability								
Right Bank (10 - 0)	9	9	7	10	10			
Left Bank (10 - 0)	9	9	10	10	10			
Vegetative Protection								
Right Bank (10 - 0)	9	9	7	10	9			
Left Bank (10 - 0)	8	8	10	9	7			
Riparian Vegetative Zone Width								
Right Bank (10 - 0)	6	6	1	5	2			
Left Bank (10 - 0)	6	5	2	2	1			
TOTAL SCORE	122	121	124	130	125			

### Footnotes:

## **Acronyms and Abbreviations:**

OU = Operable Unit

PCB = polychlorinated biphenyl

USEPA = U.S. Environmental Protection Agency

### References:

BBL. 2005. Screening Level Risk Assessment (SLERA) for Operable

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish.* Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, DC.

<sup>&</sup>lt;sup>1</sup>Habitat assessment conducted in 2005. A detailed description of methods and results is provided in BBL (2005).

<sup>&</sup>lt;sup>2</sup>Protocol based on Barbour et al. (1999).

#### Table 2-2

### Summary of Terrestrial Habitat Assessment<sup>1</sup>

(conducted using Kansas Parks Method)

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

Sumanu Lagadian	Habitat Tuna	Evaluation	KP Optimum Habitat	KP Value Score <sup>(2)</sup>	Interspersion			Adjusted Habitat Quality Rating <sup>(4)</sup>
Survey Location	Habitat Type	Key				Score	Adjacent Habitat Residential development and a park	
SC-1 East Bank	Mowed Field	Odd Area	10	3.0	-1.0	2.0	' '	Poor
SC-1 West Bank	Mowed Field	Odd Area	10	2.5	-1.0	1.5	Residential homes and roads	Poor
SC-2 East Bank	Narrow (30-ft) riparian corridor	Odd Area	10	2.5	-1.0	1.5	Residential development	Poor
SC-2 West Bank	Narrow (30-ft) mowed field	Odd Area	10	2.0	-1.0	1.0	Residential development and road ditches	Poor
SC-3 East Bank	Narrow (20-ft) upland	Woodland	10	4.75	-1.0	3.75	Abandoned construction yard	Fair
SC-3 West Bank	Narrow (10-ft) riparian upland	Woodland	10	3.75	-1.0	2.75	Riprapped embankment of railroad ROW	Poor
SC-4 East Bank	Narrow (20-ft) steep slope	Odd Area	10	4.0	-1.0	3.0	15-ft wide mowed area adjacent to a parking lot	Poor
SC-4 West Bank	Junkyard	Woodland	10	5.25	-1.0	4.25	No access	Fair
SC-5 East Bank	Narrow (10-ft) railroad ROW	Woodland	10	4.5	-1.0	3.5	Railroad line	Fair
SC-5 West Bank	Narrow (10-ft) forest edge	Woodland	10	4.5	-1.0	3.5	Parking lot	Fair
OU-1/OU-2 Average				3.8		2.9		Poor

#### Footnotes:

<sup>&</sup>lt;sup>4</sup> The Adjusted Habitat Quality Rating is the qualitative ranking of habitat quality reflected by the Modified KP Value score. Scores that fall within established ranges in the KP Method are ranked as follows:

KP Value Score range	Rank
1.0 - 3.0	poor
3.1 - 5.5	fair
5.6 - 7.9	good
8.0 - 10.0	excellent

### **Acronyms and Abbreviations:**

ft = foot/feet KP = Kansas Parks OU = Operable Unit PCB = polychlorinated biphenyl ROW = right of way

#### Reference:

BBL. 2005. Screening Level Risk Assessment (SLERA) for Operable Units 1, 2, and 3 of the Anniston PCB Site. Revision 1. December.

<sup>&</sup>lt;sup>1</sup> Habitat assessment was conducted in 2005. A detailed description of methods and results is provided in BBL (2005).

<sup>&</sup>lt;sup>2</sup> The KP Value Score is the habitat quality score resulting from the characteristics of the highest quality habitats in the evaluation area.

<sup>&</sup>lt;sup>3</sup> A site-specific interspersion factor was developed and applied to the KP Value score to account for the developed, urban nature of the land use bordering Snow Creek.

# Table 2-3 Summary of Wildlife Observations in Snow Creek

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

				Observatio	n Location <sup>1</sup>		
Common Name	Scientific Name	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	Previous Survey Observation
Birds							
American robin	Turdus migratorius	CA	FE			CA	OB
Bank swallow	Riparia riparia						OB
Barn swallow	Hirundo rustica	FG	FG	FG		FE	
Belted kingfisher	Megaceryle alcyon		FL	FL			
Blue jay	Cyanocitta cristata	RS					OB
Brown thrasher	Toxostoma rufum			FG			
Carolina chickadee	Poecile carolinensis		FG				OB
Chimney swift	Chaetura pelagica	FG		FG			
Common grackle	Quiscalus quiscula	FE	FG		FL		OB
Cuckoo	Cuculus sp.						OB
Eastern bluebird	Sialia sialis						OB
European starling	Sturnus vulgaris	FE	FL	RS	FG	FL	OB
Gray catbird	Dumetella carolinensis		CA	CA			
Great blue heron	Ardea herodias						OB
House sparrow	Passer domesticus		RS			RS	
Mourning dove	Zenaida macroura		RS				OB
Northern mockingbird	Mimus polyglottos	CA	CA	CA	CA	CA	OB
Northern cardinal	Cardinalis cardinalis		CA	CA			OB
Phoebe	Sayornis phoebe		FG				
Red-tailed hawk	Buteo jamaicensis						
Red-winged blackbird	Agelaius phoeniceus	CA					
Rock pigeon	Columba livia		FL		FL		
Song sparrow	Melospiza melodia		CA				OB
Tree swallow	Tachycineta bicolor	FG	FG	NE			_
White-breasted nuthatch	Sitta carolinensis						OB
Northern flicker (yellow-shafted)	Colaptes auratus	CA			_		

## Table 2-3 Summary of Wildlife Observations in Snow Creek

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

				Observatio	n Location <sup>1</sup>		
Common Name	Scientific Name	SC-STA-1	SC-STA-2	SC-STA-3	SC-STA-4	SC-STA-5	Previous Survey Observation
Mammals							
Domestic cat	Felis domestica		TR				
Domestic dog	Canis domestica		TR				
Harvest mouse	Reithrodontomys humulis						
Muskrat	Ondatra zibethica	FG	DHB		TR		
Rat	Rattus norvegicus		TR	TR	TR		
Bat	Microchiroptera sp.	FL					
Herptiles							
Musk turtle	Sternotherus odoratus	FG					
Gulf Coast spiny softshell	Apalone spinifera aspera	FG			OB	OB	
Copperhead	Agkistrodon contortix				FG	RS	
Cottonmouth	Agkistrodon piscivorus	FG					
Amphibians							
American toad	Bufo americanus	OB					
Bull frog	Rana catesbeiana	CA					
Green frog	Rana clamitans melanota	CA					OB
Southern leopard frog	Rana sphenocephala	CA					
Southern two-lined salamander	Eurycea cirrigera				OB		
Crustaceans							
Crayfish	Astacoidea sp.	DHB	OB		OB	OB	

### **Acronyms and Abbreviations:**

### **Wildlife Observation Codes:**

FE = Feeding NE = Nest TR = Tracks

## <sup>1</sup>Observations at Locations:

SC-STA-1 through SC-STA-5 were made during the 2005 Biological Survey. Previous observations were made during survey work conducted in 2001, 2002, and 2003. A detailed description of methods and results is provided in BBL (2005).

### Reference:

BBL. 2005. Screening Level Risk Assessment (SLERA) for Operable Units 1, 2, and 3 of the Anniston PCB Site. Revision 1. December.

# Table 3-1 Summary Statistics for Sediment Data<sup>1</sup>

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

Constituent	Sample Size	Minimum	Maximum	Mean	Median	Variance	Standard Deviation	95% UCL <sup>2</sup>	95% UCL Method
tPCB	43	0.66	60	8.9	4.0	134	12	12	95% Approximate Gamma UCL
Barium	12	52	577	163	102	23168	152	255	95% Approximate Gamma UCL
Chromium	12	28	670	130	51	34604	186	364	95% Chebyshev (Mean, Sd) UCL
Cobalt	12	2	89	19	13	546	23	33	95% Approximate Gamma UCL
Lead	12	15	510	92	53	18108	135	177	95% H-UCL
Manganese	12	340	4610	1661	1005	2169408	1473	2643	95% Approximate Gamma UCL
Mercury	12	0.013	2.2	0.40	0.20	0.37	0.61	0.82	95% Approximate Gamma UCL
Nickel	12	12	92	32	19	860	29	50	95% Approximate Gamma UCL
Vanadium	12	5.7	64	28	21	350	19	40	95% Approximate Gamma UCL

### **Acronyms and Abbreviations:**

OU = Operable Unit

PCB = polychlorinated biphenyl

tPCB = total polychlorinated biphenyl

UCL = upper confidence limit

H-UCL = UCL based on Land's H-statistic

Sd = standard deviation

### Footnotes:

<sup>&</sup>lt;sup>1</sup> Soil depth of 0-2 inch interval was used when multiple depths were sampled.

<sup>&</sup>lt;sup>2</sup> 95% UCL calculated using ProUCL Version 4.1.01.

## Table 3-2 OU-1/OU-2 Investigation Whole Water Surface Water Data for Snow Creek

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

Location ID		National Ar	mbient Water	Oxford Park							
Sample ID		Quality Criteria		S50048	S50049	S50050	S50051	S50052	S50053		
Sample Date				3/16/2007	3/16/2007	6/8/2007	6/8/2007	6/20/2007	6/20/2007		
Total Suspended Solids	Units	Acute	Chronic	310		64		496			
Barium	μg/L	NC	NC	92.9		25.6	24.1	201			
Chromium	μg/L	16	11	10.8		2	2.2	32.9			
Cobalt	μg/L	NC	NC	5		1.9	1.9	12.2			
Lead	μg/L	65	2.5	28.6		4.8	4.2	96.4			
Manganese	μg/L	NC	NC	640		72.8	68.5	2400			
Mercury	μg/L	1.4	0.77	0.15		0.018	0.018	0.43			
Nickel	μg/L	470	52	8.2		2.4	2.4	23.2			
Vanadium	μg/L	NC	NC	16.4		4.8	4.1	33.9			
Total Aroclor PCBs	μg/L	NC	0.014	0.51	0.5	0.5		0.54			
Total Homolog PCBs <sup>1</sup>	μg/L	NC	0.014	0.4	0.59	0.40		0.17			
2,3,7,8-TCDD <sup>2</sup>	pg/L	100,000	10	0.57	0.57	0.59		0.84			
WHO Dioxin TEQ <sup>2</sup>	pg/L	100,000	10	5.47	8.57	2.74		21.9			

#### Notes:

NC = no criterion available

na = not available

OU = operable unit

PCB = polychlorinated biphenyl

values in italics indicate non-detected results - value shown is the maximum reporting limit

pg/L = picograms per liter

PCDD/PCDF = polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofuran

TEQ = 2,3,7,8-TCDD Toxic Equivalents (TEQs are based on mammalian toxic equivalency factors [Vandenberg 2006])

WHO = World Health Organization.

 $\mu$ g/L = micrograms per liter

Water Quality Criteria for lead and nickel are hardness dependent. Values presented assume a hardness of 100 mg/l CaCO3.

= exceeds acute (and chronic) criterion

= exceeds chronic criterion

<sup>&</sup>lt;sup>1</sup> Total PCBs calculated 0 for non-detected homologs when at least one homolog was detected.

<sup>&</sup>lt;sup>2</sup> Criteria for 2,3,7,8-TCDD and TEQ are taken from USEPA Region 4 Freshwater Screening Values for Hazardous Waste Sites (USEPA 2001). TEQs calculated by summing PCDD/PCDF congeners using 1/2 sample reporting limit for non-detected results

# Table 3-3 Summary of RCRA Program Calculated Surface Water Data for Snow Creek

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

	Flow Event		Flow	TSS	Particulate Total PCB	Calculated Whole Water
Sampling Location	Type	Date	(cfs)	(mg/L)	(mg/kg)	PCB (µg/L)
14th Street (Upstream)	Base	June 21,1999	0.02	66	11.7	0.772
16th Street (Upstream)	Dase	June 21,1999	1.2	52	0.9	0.045
		March 22-23, 1999	16	17	9.9	0.168
		May 3-4,1999	5.0	20	2.7	0.054
	Base	May 26-27,1999	3.4	2.5*	1.0	0.002
Snow Street	Dase	June 14,1999	2.6	2.5*	0.9	0.002
Snow Street		September 27-28,1999	1.6	2.5*	0.2	0.000
		January 18,2000	2.9	2.5*	16.4	0.041
	High	April 27,1999	205	230	3.7	0.851
		April 27,1999	135	280	3.3	0.930
		January 19, 2002	480	270/290	5.2	1.196
		January 25, 2002	257	78/250	6.0	0.984
		February 6, 2002	221	41/35	5.9	0.224
		March 12, 2002	154	620	7.5	4.650
		March 30, 2002	224	400/390	2.8	1.086
		May 3, 2002	146	290/390	0.5	0.173
		June 4, 2002	133	480/350	1.7	0.685
		June 14, 2002	118	180/270	0.3	0.060
Oxford Park	High	July 10, 2002	206	220/230	5.4	1.215
		August 17, 2002	152	110/120	1.1	0.121
		August 28, 2002	154	270/280	4.1	1.130
		September 22, 2002	214	230/210	1.6	0.359
		September 25, 2002	214	100	6.3	0.630
		October 29, 2002	164	450/400	2.5	1.075
		October 29, 2002	162	150/140	3.6	0.515
		November 11, 2002	299	340/310	5.7	1.853
		November 15, 2002	172	170/160	5.0	0.825

### Notes:

cfs = cubic feet per second

mg/L = milligrams per liter

 $\mu$ g/L = micrograms per liter

mg/kg = milligrams per kilogram

OU = Operable Unit

Total PCB = total polychlorinated biphenyl calculated as the sum of PCB Aroclors, assuming 1/2 the sample reporting limit for non-detected results

RCRA = Resource Conservation and Recovery Act

TSS = Total Suspended Solids - Results for the Oxford Park location may include duplicate measurements from a single composite sample collected from the automated sampling unit.

Flows at Oxford Park were calculated from stage data.

The total PCB concentration was calculated as the sum of detected aroclors.

\* - TSS was not detected above the 5 mg/L detection limit. The value 2.5 represents one half the detection limit.

= exceeds chronic criterion of 0.014 μg/L

## Table 3-4 Summary of PCB Sediment and Tissue Data Used for Bioaccumulation Factor Development

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

			PCB Results (mg/kg dry weight) <sup>1</sup>								
EDR	BSA	Sediment Location		Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Frog	Snake	
		ELA-01-55	0.53	0.63	0.67	1.6	1.3	10	na	45	
		ELA-01-56 ELA-01-57	0.26 1.97	0.37	0.96 1.2	0.90	0.83	11	na	35	
	ELA-01	ELA-01-57 ELA-01-58	2.65	0.58	1.2	0.91	1.1	6.1	na	35	
	LLX	ELA-01-59	0.82	-							
		ELA-01-60	2.37								
		HHFL-04	1.31	1							
		ELA-02-61	3.90	0.25	0.74	0.80	0.24	12	5.4	26	
ē		ELA-02-62	2.37	0.036	0.83	0.81	0.51	8.4	5.3	na	
Lower	ELA-02	ELA-02-63	2.99	0.042	1.4	1.0	1.3	14	na	na	
-		ELA-02-64 ELA-02-65	3.17 1.19	-							
		ELA-02-66	1.10								
		ELA-03-67	4.20	0.33	0.71	0.74	0.68	11	na	30	
		ELA-03-68	0.98	0.24	0.95	0.94	0.76	11	na	48	
	ELA-03	ELA-03-69	2.04	0.042	1.2	0.61	0.87	12	na	55	
	LLA-03	ELA-03-70	0.04								
		ELA-03-71	0.10								
		ELA-03-72	0.36	0.044	0.04	4.0	0.0	10	0.4	400	
		EMA-01-01 EMA-01-02	1.22 0.70	0.041 1.1	0.31 0.55	1.6 1.3	2.6 2.6	4.9 4.6	2.4	122	
		EMA-01-03	1.14	0.39	0.69	1.3	na	6.3	na na	na na	
	EMA-01	EMA-01-04	0.36	0.00	0.00		Πα	0.0	110	110	
		EMA-01-05	1.30								
		EMA-01-06	2.27								
		HHFL-05	0.23								
		EMA-02-07	2.37	1.7	0.68	2.0	2.1	7.3	3.4	19	
		EMA-02-08 EMA-02-09	1.31	1.2	0.73	1.9 1.9	na 0.89	6.4 6.2	2.9	na	
Middle		EMA-02-10	5.15 2.27	0.054	0.58	1.9	0.89	0.2	na	na	
Mic	EMA-02	EMA-02-10	1.95								
		EMA-02-12	3.64								
		C-064-SED-1	0.11	1							
		C-065-SED-3	0.20								
		EMA-03-31	0.23	0.059	0.81	1.4	1.8	12	4.5	na	
		EMA-03-32	0.02	0.44	0.80	2.0	1.5	10	3.1	na	
	EMA-03	EMA-03-33 EMA-03-34	0.38 0.69	0.39	1.0	1.2	1.1	12	na	na	
		EMA-03-35	3.90	-							
		EMA-03-36	1.51	1							
		EUA-01-19	1.10	0.87	2.7	3.5	1.8	11	15	26	
		EUA-01-20	3.08	0.41	0.36	0.96	3.2	6.3	18	na	
		EUA-01-21	0.81	0.88	0.31	0.98	1.6	5.9	na	na	
	EUA-01	EUA-01-22	1.96								
		EUA-01-23 EUA-01-24	0.35	-							
		C-001-SED-4	2.83 1.88	1							
		EUA-02-43	1.93	0.65	27	0.86	3.8	14	9.5	167	
		EUA-02-44	0.40	0.67	23	2.9	3.3	17	2.5	na	
		EUA-02-45	1.51	0.80	18	1.3	2.2	12	na	na	
		EUA-02-46	0.26								
<u>_</u>	E114 00	EUA-02-47	1.63								
Upper	EUA-02	EUA-02-48 C-005-SED-1	0.87 0.23	-							
<u> </u>		C-005-SED-1 C-008-SED-2	0.23	1							
		C-008-SED-2	0.50	1							
		C-009-SED-1	2.13	1							
		C-010-SED-4	0.42	1							
		EUA-03-25	1.24	0.76	25	1.1	1.3	17	17	na	
		EUA-03-26	1.45	1.2	23	2.3	na	15	38	na	
		EUA-03-27	0.28	1.2	20	1.3	na	8.8	5.6	na	
	EUA-03	EUA-03-28	0.36	-							
		EUA-03-29 EUA-03-30	2.35 0.42	1							
		C-017-SED-2	8.90	1							
		C-021-SED-4	1.22	1							

## Table 3-4 Summary of PCB Sediment and Tissue Data Used for Bioaccumulation Factor Development

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

					PCB F	Results (mg/kg dr	y weight) <sup>1</sup>			
EDR	BSA	Sediment Location	Sediment	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Frog	Snake
		ERA-01-49	0.021	0.042	0.16	0.15	na	0.28	na	1.3
		ERA-01-50	0.027	0.040	0.16	0.12	na	0.27	na	1.2
		ERA-01-51	0.019	0.040	0.18	0.14	na	0.11	na	0.21
	ERA-01	ERA-01-52	0.020							
		ERA-01-53	0.024							
		ERA-01-54	0.037							
		ECO-REF-01	0.029							
		ERA-02-13	0.017	5.1	0.089	0.069	0.064	0.14	0.063	0.074
40		ERA-02-14	0.036	0.037	0.09	0.13	0.051	0.15	0.14	na
Reference		ERA-02-15	0.040	0.051	0.07	0.15	0.063	0.11	na	na
l e	ERA-02	ERA-02-16	0.024							
Sefe		ERA-02-17	0.021							
Ľ.		ERA-02-18	0.022							
		ECO-REF-02	0.029							
		ERA-03-37	0.055	0.042	0.24	0.16	na	0.15	0.06	0.028
		ERA-03-38	0.030	0.039	0.17	0.18	na	0.14	na	4.5
		ERA-03-39	0.036	0.039	0.16	0.17	na	0.13	na	na
	ERA-03	ERA-03-40	0.020							
		ERA-03-41	0.021							
		ERA-03-42	0.047							
		ECO-REF-03	0.025							

### **General Notes:**

## Red text indicates value is shown at half the reporting limit.

Total PCB calculated as non-detect = 0 if one or more Aroclor or homolog detected; if all are non-detect then one-half the highest reporting limit for individual Aroclor or homolog shown in red.

### Footnote:

## Acronyms and Abbreviations:

BSA = biological sampling area na = no sample acquired in specified area

EDR = ecologically distinct reach OU = Operable Unit

mg/kg = milligrams per kilogram PCB = polychlorinated biphenyl

<sup>&</sup>lt;sup>1</sup> Sediment, crayfish tissue, and mollusk tissue concentrations were measured as aroclors while all other tissue concentrations were measured as homologues.

### Table 3-5 Summary of Mercury Sediment and Tissue Data Used for Bioaccumulation Factor Development

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

BSA   Contains   Sediment   Plants   Insects   Invertebrates   Crayfish   Mollusks   Frog   Snake   ELA-01   ELA-01-56   0.35   0.046   0.16   0.36   0.72   0.56   na   0.78   0.062   ELA-01-56   0.19   0.052   0.21   0.36   0.26   0.80   na   0.78   0.94   ELA-01-58   0.69   ELA-01-58   0.69   ELA-01-60   0.58   0.69   ELA-01-60   0.58   ELA-02-61   0.91   0.092   0.14   0.27   0.29   0.78   0.56   1.9   ELA-02-63   0.49   0.033   0.24   0.25   0.21   1.0   na   na   ELA-02-63   0.49   0.033   0.24   0.25   0.21   1.0   na   na   ELA-02-64   0.57   ELA-02-66   0.59   ELA-02						Mercury	Results (mg/kg d	lry weight)			
ELA-01 ELA-01-55 0.35 0.066 0.16 0.36 0.72 0.56 na 0.72 0.56 ElA-01-57 0.052 0.052 0.048 0.25 0.32 0.19 0.52 na 0.94   ELA-01-57 0.052 0.048 0.25 0.32 0.19 0.52 na 0.94   ELA-01-59 6.30   ELA-01-59 6.30   ELA-01-59 0.530   ELA-01-60 0.58   HHFI-04 0.38   ELA-02-62 0.75 0.069 0.19 0.58 0.20 0.85 0.32 na   ELA-02-63 0.49 0.033 0.24 0.25 0.21 1.0 na   na   ELA-02-63 0.49 0.033 0.24 0.25 0.21 1.0 na   na   ELA-02-64 0.27   ELA-02-68 0.55   ELA-03 ELA-03-68 0.37 0.067 0.11 0.70 0.14 0.88 na 1.4   ELA-03-88 0.37 0.067 0.11 0.70 0.14 0.88 na 1.4   ELA-03-70 0.16   ELA-03-70 0.16   ELA-03-71 0.22   ELA-03-72 0.19   EMA-01 0.43 0.063 0.15 0.22 0.19 0.17 0.67 0.54   EMA-01-02 0.61 0.049 0.19 0.24 0.17 0.37 0.33 na   EMA-01-02 0.61 0.049 0.19 0.24 0.17 0.37 0.33 na   EMA-01-03 0.73 0.081 0.32 0.32   EMA-01-06 0.91   EMA-01-07 0.055 0.059   EMA-02-07 0.055 0.069 0.077 0.44 0.22 0.19 0.17 0.67 0.54   EMA-01-08 0.91   EMA-01-09 0.01   EMA-02-07 0.055 0.069 0.077 0.44 0.21 0.27 0.33 1.7   EMA-02-09 1.10 0.38 0.038 0.23 0.14 0.33 na   na   EMA-02-09 1.10 0.38 0.038 0.23 0.14 0.33 na   na   EMA-02-09 0.04   EMA-02-01 0.69   EMA-02-11 0.47   EMA-03-33 0.43 0.047 0.13 0.41 0.14 0.37 0.37 na   EMA-02-11 0.47   EMA-03-33 0.43 0.047 0.13 0.41 0.14 0.37 0.37 na   EMA-03-12 0.05   EMA-03-13 0.30 0.049 0.15 0.30 0.12 0.42 0.28 na   EMA-03-13 0.30 0.049 0.15 0.30 0.12 0.14 0.63 0.88   EMA-03-13 0.30 0.040 0.10 0.19 0.13 0.14 0.10 na   EMA-03-13 0.31 0.30 0.040 0.10 0.19 0.13 0.14 0.10 na   EMA-03-13 0.31 0.30 0.040 0.10 0.19 0.13 0.14 0.10 na   EMA-03-13 0.32 0.43 0.047 0.15 0.27 0.13 0.80 0.26 0.12 0.61   EMA-03-14 0.05 0.05 0.05 0.005	EDR	BSA		Sediment				Crayfish	Mollusks	Frog	Snake
### ELA-01-57		ELA-01	ELA-01-55	0.35		0.16	0.36		0.56	na	0.78
### ELA-01-58										na	
## ELA-01-59					0.048	0.25	0.32	0.19	0.52	na	0.94
EIA-01-60											
Hiff-O4											
ELA-02 ELA-02-61 0.91 0.91 0.092 0.14 0.27 0.29 0.78 0.56 1.92 ELA-02-62 0.75 0.069 0.19 0.58 0.32 0.85 0.32 0.85 ELA-02-63 0.49 0.033 0.24 0.25 0.21 1.0 ns na ELA-02-64 0.27 ELA-02-65 0.59 ELA-02-65 0.59 ELA-03-67 1.60 0.073 0.08 0.26 0.11 0.73 na 2.1 ELA-03-68 0.37 0.067 0.11 0.70 0.14 0.88 na 1.4 ELA-03-69 0.43 0.060 0.17 0.34 0.14 0.78 na 0.42 ELA-03-70 0.16 ELA-03-71 0.22 ELA-03-71 0.22 ELA-03-72 0.19 EMA-01-01 0.43 0.063 0.15 0.22 0.19 0.17 0.67 0.54 EMA-01-03 0.73 0.081 0.32 0.32 na 0.14 na na EMA-01-03 0.73 0.081 0.32 0.32 na 0.14 na na EMA-01-05 0.50 EMA-01-05 0.068 0.069 0.077 0.00 EMA-01-05 0.00 EMA-01-											
ELA-02-62		EI A 02			0.002	0.14	0.27	0.20	0.78	0.56	1.0
ELA-02-63	_	LLA-02									
ELA-02-66 0.52  ELA-03-67 1.60 0.59  ELA-03 ELA-03-67 1.60 0.073 0.08 0.28 0.11 0.73 na 2.1  ELA-03-68 0.37 0.067 0.11 0.70 0.14 0.88 na 1.4  ELA-03-69 0.43 0.060 0.17 0.34 0.14 0.78 na 0.42  ELA-03-71 0.22  ELA-03-71 0.22  ELA-03-72 0.19  EMA-01 EMA-01-01 0.43 0.063 0.15 0.22 0.19 0.17 0.67 0.54  EMA-01-02 0.61 0.049 0.19 0.24 0.17 0.37 0.33 na EMA-01-03 0.73 0.081 0.32 0.32 na 0.14 na na EMA-01-04 0.74  EMA-01-04 0.74  EMA-01-05 0.59  EMA-02 EMA-02-07 0.65 0.069 0.077 0.44 0.21 0.27 0.33 1.7  EMA-02-08 0.84 0.081 0.034 0.26 na 0.28 0.24 na EMA-02-09 1.10 0.69  EMA-02-10 0.69  EMA-02-11 0.47  EMA-02-12 0.87  EMA-03-31 0.30 0.049 0.15 0.30 0.14 0.33 na na na EMA-03-32 0.43 0.047 0.13 0.41 0.14 0.37 0.37 na EMA-03-33 0.45 0.049 0.12 0.28 0.20 0.36 1.8 na EMA-03-34 0.51  EMA-03-34 0.51  EMA-03-36 0.75  EMA-02-20 0.83 0.049 0.13 0.13 0.12 0.14 0.63 0.88  EMA-03-36 0.75  EUA-01 EUA-01-22 0.39  EUA-01-22 0.39  EUA-01-24 0.069 0.069 0.070  EUA-01-24 0.069 0.069 0.070  EUA-01-24 0.069 0.069 0.070  EUA-01-20 0.83 0.049 0.15 0.30 0.12 0.42 0.28 na EMA-03-35 0.81  EMA-03-36 0.75  EUA-01 EUA-01-19 2.60 0.049 0.13 0.13 0.12 0.14 0.63 0.88  EUA-01-20 0.83 0.040 0.10 0.19 0.13 0.14 1.0 na EUA-01-22 0.30 0.046 0.11 0.16 0.12 0.16 na na EUA-01-22 0.30 0.046 0.11 0.16 0.12 0.16 na na EUA-01-22 0.30 0.046 0.11 0.16 0.12 0.16 na na EUA-01-23 0.78  EUA-02-47 1.00 0.065 0.30 0.19 0.14 0.25 na na EUA-02-48 1.30 0.068 0.23 0.31 0.12 0.30 0.13 na EUA-02-48 1.30 0.068 0.23 0.31 0.19 0.14 0.25 na na EUA-03-26 0.36 0.10 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.36 EUA-03-26 0.36 0.10 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.36 0.10 0.088 0.42 0.18 0.19 0.19 0.32 0.73 na EUA-03-26 0.36 0.10 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.36 0.10 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.36 0.10 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.36 0.19 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.36 0.19 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.36 0.19 0.088 0.42 0.18 0.19 0.32 0.73 na 0.22 0.73 na EUA-03-26 0.36 0.36 0.36 0.3	We										
### ELA-02-66	2										
ELA-03 ELA-03-67 1.60 0.073 0.08 0.26 0.11 0.73 na 2.1   ELA-03-68 0.37 0.667 0.11 0.70 0.14 0.88 na 1.4   ELA-03-69 0.43 0.060 0.17 0.34 0.14 0.78 na 0.42   ELA-03-70 0.16   ELA-03-71 0.22   ELA-03-71 0.22   ELA-03-72 0.19   EMA-01-01 0.43 0.063 0.15 0.22 0.19 0.17 0.67 0.54   EMA-01-02 0.61 0.049 0.19 0.24 0.17 0.37 0.33 na   EMA-01-03 0.73 0.081 0.32 0.32 na 0.14 na na   EMA-01-05 0.50   EMA-01-05 0.50   EMA-01-06 0.91   HHFL-05 0.51   EMA-02-09 1.10 0.38 0.038 0.23 0.14 0.33 na   EMA-02-09 1.10 0.38 0.038 0.23 0.14 0.33 na   EMA-02-10 0.69   EMA-02-11 0.47   EMA-02-11 0.47   EMA-02-12 0.87   EMA-03-31 0.30 0.049 0.15 0.30 0.12 0.42 0.28 na   EMA-03-33 0.45 0.047 0.13 0.41 0.14 0.37 0.37 na   EMA-03-33 0.45 0.049 0.12 0.28 0.20 0.36 1.8 na   EMA-03-36 0.75   EMA-03-36 0.75   EUA-01 EUA-01-22 0.83 0.040 0.10 0.19 0.13 0.14 1.0 na   EUA-01-22 0.083 0.046 0.11 0.16 0.12 0.16 na   EUA-01-24 0.05 0.83 0.040 0.10 0.19 0.13 0.14 1.0 na   EUA-01-24 0.05   EUA-01-24 0.05   EUA-02-47 1.00   C-005-8ED-2 0.65   EUA-02-48 1.30   EUA-03-29 0.86   EUA-03-2											
### ELA-03-68   0.37   0.067   0.11   0.70   0.14   0.88   na   1.4    ### ELA-03-69   0.43   0.060   0.17   0.34   0.14   0.78   na   0.42    ### ELA-03-70   0.16    ### ELA-03-71   0.22    ### ELA-03-72   0.19    ### EMA-01   EMA-01-02   0.61   0.049   0.19   0.24   0.17   0.37   0.33   na    ### EMA-01-02   0.61   0.049   0.19   0.24   0.17   0.37   0.33   na    ### EMA-01-03   0.73   0.081   0.32   0.32   na   0.14   na   na    ### EMA-01-05   0.50    ### EMA-01-05   0.50    ### EMA-02   EMA-02-07   0.65   0.069   0.077   0.44   0.21   0.27   0.33   1.7    ### EMA-02   EMA-02-08   0.84   0.081   0.034   0.26   na   0.28   0.24   na    ### EMA-02-09   0.10   0.38   0.038   0.23   0.14   0.33   na   na    ### EMA-02-10   0.69    ### EMA-02-11   0.47    ### EMA-03-31   0.30   0.049   0.15   0.30   0.12   0.42   0.28   na    ### EMA-03-32   0.43   0.049   0.13   0.41   0.14   0.37   0.37   0.37   na    ### EMA-03-35   0.81    ### EMA-03-36   0.81    ### EMA-03-36   0.81    ### EMA-03-37   0.30   0.049   0.13   0.13   0.12   0.14   0.63   0.88    ### EUA-01-22   0.30    ### EUA-01-23   0.78    ### EUA-02-47   1.00    ### COOFS ED-2   0.65    ### EUA-03-28   0.36    ### EUA-03-28   0.36    ### EUA-03-28   0.36    ### EUA-03-28   0.36    ### EUA-03-29   0.86    ### EUA-03-29   0.86    ### EUA-03-29   0.86    ### EUA-03-30   0.09    ### EUA-03-30   0.09    ### EUA-03-30   0.08    ### EUA-03-30   0.09    ### EUA-03-30   0.08    ### EUA-03-28   0.36    ### EUA-03-30   0.08    ### EUA-03-28   0.36    ### EUA-03-30   0.08    ### EUA-03-30   0.08    ### EUA-03-30   0.08    ### EUA-03-28   0.36    ### EUA-03-30   0.08    ### EUA-03-28   0.36    ### EUA-03-30   0.08			ELA-02-66	0.59							
### EIA-03-69		ELA-03						0.11		na	
### ELA-03-70										na	
ELA-03-71					0.060	0.17	0.34	0.14	0.78	na	0.42
ELA-03-72											
EMA-01   EMA-01-01   0.43   0.063   0.15   0.22   0.19   0.17   0.67   0.54   EMA-01-02   0.61   0.049   0.19   0.24   0.17   0.37   0.33   na   EMA-01-03   0.73   0.081   0.32   0.32   na   0.14   na   na   EMA-01-04   0.74   EMA-01-05   0.50   EMA-01-06   0.91   HHFL-05   0.51   EMA-02-07   0.65   0.069   0.077   0.44   0.21   0.27   0.33   1.7   EMA-02-08   0.84   0.081   0.034   0.26   na   0.28   0.24   na   EMA-02-10   0.69   EMA-02-11   0.47   EMA-02-12   0.87   EMA-03   EMA-03-32   0.43   0.047   0.13   0.14   0.14   0.37   0.37   na   EMA-03-33   0.45   0.049   0.15   0.30   0.12   0.42   0.28   na   EMA-03-34   0.51   EMA-03-35   0.81   EMA-03-36   0.75   EMA-01-21   2.90   0.046   0.11   0.16   0.12   0.16   na   na   EMA-01-23   0.78   EUA-01-21   2.90   0.046   0.11   0.16   0.12   0.16   na   na   EUA-01-23   0.78   EUA-02-46   0.05   EUA-02-46   0.05   EUA-02-47   1.00   C-005-8D-2   0.65   EUA-02-28   0.35   EUA-03-29   0.86   EUA-03-20   0.013   0.064   0.066   0.091   na   0.23   na   1.0											
EMA-01-02		EMA 01			0.063	0.15	0.22	0.10	0.17	0.67	0.54
EMA-01-03		⊏IVIA-U1									
EMA-01-04											
EMA-01-05					0.001	0.02	0.02				
HHFL-05											
EMA-02-07			EMA-01-06	0.91							
EMA-02-08			HHFL-05								
EMA-02-09		EMA-02						0.21			1.7
EMA-02-11	<u>e</u>										
EMA-02-11	Aidc				0.38	0.038	0.23	0.14	0.33	na	na
EMA-03   EMA-03-31   0.30   0.049   0.15   0.30   0.12   0.42   0.28   na   EMA-03-32   0.43   0.047   0.13   0.41   0.14   0.37   0.37   na   EMA-03-33   0.45   0.049   0.12   0.28   0.20   0.36   1.8   na   EMA-03-35   0.81   EMA-03-36   0.83   0.040   0.10   0.19   0.13   0.14   1.0   na   EUA-01-21   2.90   0.046   0.11   0.16   0.12   0.16   na   na   EUA-01-21   2.90   0.046   0.11   0.16   0.12   0.16   na   na   EUA-01-22   0.30   EUA-01-23   0.78   EUA-01-24   0.75   EUA-02-44   0.04   0.085   0.23   0.31   0.12   0.30   0.13   na   EUA-02-45   0.32   0.065   0.30   0.19   0.14   0.25   na   na   EUA-02-46   0.05   EUA-02-47   1.00   EUA-02-48   1.30   EUA-02-48   1.30   EUA-02-48   1.30   EUA-03-26   0.91   0.080   0.36   0.28   na   0.38   1.0   na   EUA-03-27   0.27   0.11   0.32   0.15   na   0.22   0.86   na   EUA-03-28   0.36   EUA-03-29   0.86   EUA-03-29   0.86   EUA-03-29   0.86   EUA-03-30   1.00   ERA-01   E	_										
EMA-03   EMA-03-31   0.30   0.049   0.15   0.30   0.12   0.42   0.28   na   EMA-03-32   0.43   0.047   0.13   0.41   0.14   0.37   0.37   na   EMA-03-33   0.45   0.049   0.12   0.28   0.20   0.36   1.8   na   EMA-03-34   0.51   EMA-03-35   0.81   EMA-03-36   0.75   EMA-03-36   0.75   EUA-01-19   2.60   0.049   0.13   0.13   0.12   0.14   0.63   0.88   EUA-01-20   0.83   0.040   0.10   0.19   0.13   0.14   1.0   na   EUA-01-21   2.90   0.046   0.11   0.16   0.12   0.16   na   na   EUA-01-22   0.30   EUA-01-23   0.78   EUA-01-24   0.75   EUA-02-44   0.04   0.085   0.23   0.31   0.12   0.30   0.13   na   EUA-02-45   0.32   0.065   0.30   0.19   0.14   0.25   na   na   EUA-02-46   0.05   EUA-02-47   1.00   C-005-SED-2   0.65   EUA-02-48   1.30   EUA-03-26   0.91   0.080   0.36   0.28   na   0.38   1.0   na   EUA-03-27   0.27   0.11   0.32   0.15   na   0.22   0.86   na   EUA-03-29   0.86   EUA-03-29   0.86   EUA-03-29   0.86   EUA-03-29   0.86   EUA-03-30   1.00   ERA-01   ERA-01-49   0.013   0.064   0.066   0.091   na   0.23   na   1.0											
EMA-03-32		FMA-03			0.049	0.15	0.30	0.12	0.42	0.28	na
EMA-03-33		LIVIA-03									
EMA-03-34											
EMA-03-36											
EUA-01   EUA-01-19   2.60   0.049   0.13   0.13   0.12   0.14   0.63   0.88											
EUA-01-20											
EUA-01-21		EUA-01									
EUA-01-22											
EUA-01-23					0.046	0.11	0.16	0.12	0.16	па	na
EUA-02 4 0.75  EUA-02											
EUA-02   EUA-02-43   0.47   0.075   0.27   0.13   0.80   0.26   0.12   0.61											
EUA-02-44		EUA-02			0.075	0.27	0.13	0.80	0.26	0.12	0.61
EUA-02-46			EUA-02-44		0.085		0.31		0.30	0.13	na
EUA-03 EUA-03-25 1.30 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.91 0.080 0.36 0.28 na 0.38 1.0 na EUA-03-27 0.27 0.11 0.32 0.15 na 0.22 0.86 na EUA-03-28 0.35 EUA-03-29 0.86 EUA-03-30 1.00 ERA-01 ERA-01-49 0.013 0.064 0.066 0.091 na 0.23 na 1.0	e				0.065	0.30	0.19	0.14	0.25	na	na
EUA-03 EUA-03-25 1.30 0.088 0.42 0.18 0.19 0.32 0.73 na EUA-03-26 0.91 0.080 0.36 0.28 na 0.38 1.0 na EUA-03-27 0.27 0.11 0.32 0.15 na 0.22 0.86 na EUA-03-28 0.35 EUA-03-29 0.86 EUA-03-30 1.00 ERA-01 ERA-01-49 0.013 0.064 0.066 0.091 na 0.23 na 1.0	ddr										
EUA-02-48 1.30  EUA-03	ا ر										
EUA-03											
EUA-03-26 0.91 0.080 0.36 0.28 na 0.38 1.0 na EUA-03-27 0.27 0.11 0.32 0.15 na 0.22 0.86 na EUA-03-28 0.35 EUA-03-29 0.86 EUA-03-30 1.00 ERA-01 ERA-01-49 0.013 0.064 0.066 0.091 na 0.23 na 1.0		ELIA 03			0 088	0.42	0.10	0.10	0.33	0.73	na
EUA-03-27 0.27 0.11 0.32 0.15 na 0.22 0.86 na EUA-03-28 0.35 EUA-03-29 0.86 EUA-03-30 1.00 ERA-01 ERA-01-49 0.013 0.064 0.066 0.091 na 0.23 na 1.0		EUA-03									
EUA-03-28 0.35 EUA-03-29 0.86 EUA-03-30 1.00 ERA-01 ERA-01-49 0.013 0.064 0.066 0.091 na 0.23 na 1.0											
EUA-03-29 0.86 EUA-03-30 1.00 ERA-01 ERA-01-49 0.013 0.064 0.066 0.091 na 0.23 na 1.0					2	<u> </u>				2.00	
EUA-03-30 1.00 ERA-01 ERA-01-49 0.013 0.064 0.066 0.091 na 0.23 na 1.0											
		<u> </u>			<u> </u>						
		ERA-01						na		na	
ERA-01-51					0.046	0.035	0.090	na	0.24	na	0.41
ERA-01-52 0.015			EKA-01-52	0.015							

### Table 3-5 Summary of Mercury Sediment and Tissue Data Used for Bioaccumulation Factor Development

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

					Mercury	Results (mg/kg d	lry weight)			
EDR	BSA	Sediment Location	Sediment	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Frog	Snake
		ERA-01-53	0.016					•		
		ERA-01-54	0.027							
		ECO-REF-01	0.01							
	ERA-02	ERA-02-13	0.012	0.038	0.068	0.10	0.06	0.70	0.11	0.50
a)		ERA-02-14	0.026	0.035	0.041	0.16	0.10	0.57	0.11	na
Reference		ERA-02-15	0.034	0.041	0.048	0.20	0.09	0.68	na	na
e e		ERA-02-16	0.015							
Sefe		ERA-02-17	0.016							
"		ERA-02-18	0.015							
		ECO-REF-02	0.022							
	ERA-03	ERA-03-37	0.11	0.036	0.17	0.075	na	0.29	0.11	0.32
		ERA-03-38	0.032	0.033	0.17	0.064	na	0.20	na	0.57
		ERA-03-39	0.041	0.033	0.25	0.070	na	0.17	na	na
		ERA-03-40	0.013							
		ERA-03-41	0.014							
		ERA-03-42	0.041							
		ECO-REF-03	0.016							

#### **General Note:**

Red text indicates value is shown at half the reporting limit.

### **Acronyms and Abbreviations:**

BSA = biological sampling area na = no sample acquired in specified area

EDR = ecologically distinct reach OU = Operable Unit

mg/kg = milligrams per kilogram PCB = polychlorinated biphenyl

### Table 3-6 Summary of Metals Sediment and Tissue Data Used for Bioaccumulation Factor Development

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

			Measured Con	centrations (m	g/kg dry weight)		
Sample ID	Barium	Chromium	Cobalt	Lead	Manganese	Nickel	Vanadium
Sediment	Darium	Omomuni	Joban	Load	Manganese	HICKOI	Vanadiani
ELA-01	18.95	8.15	2.45	7.05	146	2.30	5.05
ELA-02	26.90	8.50	3.40	8.40	110	3.20	5.30
EMA-01	33.00	7.60	3.50	8.00	271	3.80	5.00
EMA-03	33.90	7.60	2.30	4.30	171	2.40	3.40
EUA-02	82.90	16.90	7.00	13.90	397	4.40	17.20
EUA-03	35.10	18.10	4.10	10.40	354	5.00	7.40
ERA-01	90.90	8.30	8.50	12.60	245	6.20	11.00
ERA-03	84.70	30.90	14.90	12.60	537	11.90	34.30
HHFL-04	14.30	13.60	3.90	9.20	86.30	3.40	7.60
HHFL-05	24.10	6.30	2.55	5.95	217	2.25	3.15
C-005-SED-2	47.50	20.80	10.50	10.20	519	9.20	9.40
ECO-REF-01	42.80	4.50	3.90	6.20	45	3.70	6.30
ECO-REF-02	110.00	8.20	8.10	11.60	442	6.40	11.40
ECO-REF-03	24.80	26.60	6.70	8.00	248	8.40	17.30
Average	47.85	13.29	5.84	9.17	271	5.18	10.27
Aquatic Plants							
ELA-01	66.24	0.18	0.45	1.78	1274	0.64	0.18
EMA-03	50.00	3.13	5.00	3.96	861	0.97	1.94
EUA-02	70.12	2.57	5.00	7.05	1012	0.18	1.49
ERA-03	118.26	4.57	5.02	1.92	1648	2.42	6.85
Average	76.16	2.61	3.87	3.68	1199	1.05	2.62
Ratio of Means BAF	1.59	0.20	0.66	0.40	4.43	0.20	0.25
Emergent Insects							
ELA-03	5.14	13.36	0.28	0.45	30.82	7.53	0.01
EMA-02	11.35	11.66	5.00	0.67	102	7.36	0.58
EUA-02	4.42	2.00	5.00	0.29	18.37	1.60	2.00
ERA-01	9.22	3.09	0.08	0.28	24.82	1.74	0.31
Average	7.53	7.52	2.59	0.42	43.89	4.56	0.73
Ratio of Means BAF	0.16	0.57	0.44	0.05	0.16	0.88	0.07
Benthic Invertebrates							
ELA-03	37.34	3.23	5.00	3.61	709	1.77	2.22
EMA-03	37.33	3.87	4.27	5.00	1620	2.27	2.47
EUA-02	60.00	3.33	4.44	6.00	3589	2.78	2.56
ERA-01	29.34	1.56	2.40	1.56	1090	1.26	1.68
Average	41.00	3.00	4.03	4.04	1751.9	2.02	2.23
Ratio of Means BAF	0.86	0.23	0.69	0.44	6.48	0.39	0.22
Crayfish					<del>,</del>		_
ELA-01	107	2.00	5.00	0.94	402	0.02	2.00
EUA-02	162	2.00	5.00	1.80	584	0.02	2.00
EUA-03	199	1.39	5.00	3.28	1026	0.16	1.39
Average	156	1.80	5.00	2.01	671	0.06	1.80
Ratio of Means BAF	3.26	0.14	na	0.22	2.48	na	0.17
Mollusks		1 40 1		1	1 , 1		T
ELA-03	33.54	13.66	3.60	3.73	169	4.35	1.49
EMA-03	27.06	9.65	3.88	4.47	172	2.12	1.88
EUA-01	34.78	9.44	3.48	3.60	237	1.74	1.86
ERA-03	42.11	6.18	5.92	1.71	511	4.08	5.53
Average	34.37	9.73	4.22	3.38	272	3.07	2.69
Ratio of Means BAF	0.72	0.73	0.72	0.37	1.01	0.59	0.26
Frog	1 00:				1 40 = :		1 000
ELA-03	9.91	2.00	5.00	0.77	40.54	0.02	2.00
ERA-01	8.78	1.45	0.38	0.27	36.26	0.02	0.57
Average	9.34	1.73	2.69	0.52	38.40	0.02	1.29
Ratio of Means BAF	0.20	0.13	0.46	0.06	0.14	na	0.13
Snake							
EUA-01	43.70	7.14	1.55	2.65	592	3.28	1.01
EUA-01a	43.98	18.06	1.44	4.12	150	8.80	1.62
Average	43.84	12.60	1.49	3.38	371	6.04	1.31
Ratio of Means BAF	0.92	0.95	0.26	0.37	1.37	1.16	0.13

### General Note:

Red text indicates value is shown at half the reporting limit.

### Acronyms and Abbreviations:

BAF = bioaccumulation factor mg/kg = milligrams per kilogram OU = Operable Unit PCB = polychlorinated biphenyl

# Table 4-1 Summary of Sediment to Aquatic Biota Bioaccumulation Factors

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

Constituent	Sediment to Aquatic Plants	Sediment to Emergent Insects	Sediment to Benthic Invertebrates*	Sediment to Crayfish	Sediment to Mollusks	Sediment to Frogs	Sediment to Snakes
tPCB*	0.42	3.80	0.92	0.75	6.50	3.40	26.91
Barium	1.59	0.16	0.86	3.26	0.72	0.20	0.92
Chromium	0.20	0.57	0.23	0.14	0.73	0.13	0.95
Cobalt	0.66	0.44	0.69	0.72	0.72	0.46	0.26
Lead	0.40	0.05	0.44	0.22	0.37	0.06	0.37
Manganese	4.43	0.16	6.48	2.48	1.01	0.14	1.37
Mercury	0.11	0.25	0.39	0.27	0.47	0.75	1.11
Nickel	0.20	0.88	0.39	0.59	0.59	1.16	1.16
Vanadium	0.25	0.07	0.22	0.17	0.26	0.13	0.13

### **General Notes:**

Equation based on log normalized sediment dry and tissue dry weight (log (tissue concentration dw) = 0.6272\*(log sediment PCBdw)+1.0224 BAFs calculated as dry weight tissue over dry weight sediment.

Values shown in italics could not be computed because all tissue samples were non detected. For crayfish, mollusk value used as surrogate. For frogs, snake value used as a surrogate.

### **Acronyms and Abbreviations:**

BAF = bioaccumulation factor

OU = Operable Unit

tPCB = total polychlorinated biphenyl

<sup>\*</sup> PCB uptake also evaluated based on the regression equation from the laboratory data analysis (see Appendix A)

### Table 4-2 Avian Receptor Exposure Parameters

#### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

		Aquatic Herbivore	A	erial-Feeding Insectivore		Aquatic Invertivore		Aquatic Omnivore
		Mallard		Tree Swallow		Spotted Sandpiper		Pied-Billed Grebe
Parameter	Data	Source	Data	Source	Data	Source	Data	Source
Composition of Diet (%)								
Sediment	6%	Beyer et al. (1994) and Connor (1993), average of values	0%	Assumed to be negligible based on feeding strategy	18%	Beyer et al. (1994), average of four sandpiper values	6%	Mallard value assumed as a surrogate
Aquatic Plants	80%		0%		0%		10%	
Emergent Insects	0%	Herbivorous diet was chosen in	100%	Robertson et al. (1992)	50%		5%	Diet adapted from Wetmore
Benthic Invertebrates	10%	order to evaluate mallard as an	0%		50%	Diet adapted from Oring et al.	53%	1924 (in Muller and Storer
Crayfish	herbivorous receptor. Diet is based on professional judgment,		0%		0%	(1997) using professional judgment to adjust based on	20%	1999), using professional
Mollusk	10%				0%	food items available within Snow Creek portion of OU-1/OU-2.	2%	judgment to adjust based on food items available within Snow
Amphibians	0%	mallard diet in coastal Louisiana.	0%		0%	, , , , , , , , , , , , , , , , , , , ,	10%	Creek portion of OU-1/OU-2.
Body Weight (kg)	1.2	Average of non-breeding, adult birds (Drilling et al. 2002)	0.021	Robertson et al. (1992)	0.043	USEPA (1993), average of reported values	0.42	Average of both sexes (Muller and Storer 1999)
Food Ingestion Rate (kg/kg bw/d) (dw)	0.087	Average from Chukwudebe et al., 1998. Converted to dw using assumed % moisture in feed of 12%	0.24	Nagy (2001), allometric equation for insectivores	0.18	Nagy (2001), allometric equation for insectivores	0.071	Nagy (2001), allometric equation for omnivores

#### Acronyms and Abbreviations:

-- = not applicable

dw = dry weight

kg = kilogram

kg/kg bw/d = kg/kg body weight per day

OU = Operable Unit

PCB = polychlorinated biphenyl

USEPA = U.S. Environmental Protection Agency

#### References

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### Table 4-3 Mammalian Receptor Exposure Parameters

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

		Herbivore	Mammal	ian Aerial-Feeding Insectivore		Mammalian Omnivore
Parameter		Muskrat		Little Brown Bat		Raccoon
	Data	Source	Data	Source	Data	Source
Composition of Diet (%)						
Sediment	9%	Beyer et al. (1994), muskrat used as surrogate	0%	Assumed to be negligible for aerial-feeding insectivores	9%	Beyer et al. (1994)
Aquatic Plants	90%	5	0%		44%	
Emergent Insects	0%	Diet adapted from USEPA 1993, using professional judgment to adjust based on	100%	Belwood and Fenton (1976), as cited in Sample and Suter (1994)	0%	Diet adapted from USEPA 1993, using professional
Benthic Invertebrates	5%	food items available within	0%		13%	judgment to adjust based on
Crayfish	0%	Snow Creek portion of OU-1/O			15%	food items available within
Mollusk	5%	river and stream habitat diet	0%		13%	Snow Creek portion of OU-1/OU-
Frogs	0%	includes mollusks (Neves and	0%		10%	
Snakes	0%	Odom 1989).	0%		5%	
Body Weight (kg)		1.1 Average of values given in Reid (2006)		Nagy (2001), allometric equation for little brown bat	5.6	USEPA (1993), average of adult and juvenile means values
Food Ingestion Rate (kg/kg bw/d) (dw)	0.07	Nagy (2001), allometric equation for Rodentia	0.18	Nagy (2001), allometric equation for little brown bat	0.03	Nagy (2001), allometric equation for Omnivores

#### Acronyms and Abbreviations:

-- = not applicable

dw = dry weight

kg = kilogram

kg/kg bw/d = kg/kg body weight per day

OU = Operable Unit

PCB = polychlorinated biphenyl

USEPA = U.S. Environmental Protection Agency

#### References:

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Table 5-1
Summary of Sediment Benchmarks and PCB Site-Specific Toxicity Values

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston AL

	Low Threshold <sup>1</sup>	High Threshold <sup>1</sup>
COPC	mg/kg dw	mg/kg dw
tPCBs <sup>2</sup>	1.4	4.4
tPCBs	0.06	0.676
Barium	NV	NV
Chromium (III)	43	111
Cobalt	50	NV
Lead	36	128
Manganese	NV	NV
Mercury (total)	0.18	1.1
Nickel	23	49
Vanadium	NV	NV

#### Footnotes:

See Appendix B for details on development.

#### **Acronyms and Abbreviations:**

COPC = constituent of potential concern mg/kg dw = milligrams per kilogram dry weight NV = no threshold value available OU = operable unit PCB = polychlorinated biphenyl

### Reference:

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. *Arch. Environ. Contam. Toxicol.* 39:20-31.

<sup>&</sup>lt;sup>1</sup> Benchmarks are Threshold Effect Concentrations and Probable Effects Concentrations taken from MacDonald et al. (2000) unless otherwise noted.

<sup>&</sup>lt;sup>2</sup> PCB values are EC0 and EC20 values for most sensitive species and endpoint from site-specific toxicity testing.

### Table 5-2 Summary of Avian and Mammalian Toxicity Reference Values

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

			Wildlife Toxicity Reference Value	ues (mg/kg bw/d)		
			Birds		Mammals	
COPC	NOAEL TRV	LOAEL TRV	Reference	NOAEL TRV	LOAEL TRV	Reference
tPCB (mid-range sensitivity)	0.47	1.4	Koval et al 1987; NOAEL extrapolated	0.23	0.68	McCoy et al. 1995
tPCB (high sensitivity)	0.043	0.13	Lillie et al. 1974; NOAEL extrapolated	NA	NA	NA
Barium	21	42	Sample et al. 1996 <sup>1</sup>	52	121	USEPA 2005a
Chromium	2.7	2.8	USEPA 2008	2.4	2.8	USEPA 2008
Cobalt	7.6	7.8	USEPA 2005b	7.3	10	USEPA 2005b
Lead	1.6	3.3	USEPA 2005c	4.7	8.9	USEPA 2005c
Manganese	179	348	USEPA 2007a	52	65	USEPA 2007a
Mercury	0.023	0.068	Spalding et al. 2000; NOAEL extrapolated	0.075	0.15	Dansereau et al. 1999
Nickel	6.7	8.2	USEPA 2007b	1.7	3.4	USEPA 2007b
Vanadium	0.34	0.70	USEPA 2005d	4.2	8.3	USEPA 2005d

#### Footnotes:

#### Acronyms and Abbreviations:

COPC = contaminant of potential concern

LOAEL = lowest observed adverse effect level

mg/kg bw/d = milligrams per kilogram of body weight per day

NA = not applicable NOAEL = no observed adverse effect level OU = Operable Unit tPCB = total polychlorinated biphenyl TRV = toxicity reference value

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See Appendix C for details on development of specific TRVs.

### Table 6-1 Avian Site-Specific Risk-Based Concentration Calculations

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

				Perc	ent Diet (º	⁄₀)						ulation Factors /dw sediment)			Body Weight (kg)	Normalized Ingestion Rate (kg dw/kg bw/d)	TF (mg/			RBC sediment)
Aquatic Receptors	Constituent	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Amphibians Sec	ediment	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Amphibians	BW	IR	NOAEL TRV	LOAEL TRV	NOAEL SSRBC	LOAEL SSRBC
	tPCB (mid-range sensitivity)	80%	0%	10%	0%	10%	0%	6%	0.42	3.80	0.92	0.75	6.50	3.40	1.17	0.09	0.47	1.4	5	14
	tPCB (high sensitivity)	80%	0%	10%	0%	10%	0%	6%	0.42	3.80	0.92	0.75	6.50	3.40	1.17	0.09	0.043	0.13	0.4	1.3
	Barium	80%	0%	10%	0%	10%	0%	6%	1.59	0.16	0.86	3.26	0.72	0.20	1.17	0.09	21	42	160	322
	Chromium	80%	0%	10%	0%	10%	0%	6%	0.20	0.57	0.23	0.14	0.73	0.13	1.17	0.09	2.7	2.8	97	102
Mallard	Cobalt	80%	0%	10%	0%	10%	0%	6%	0.66	0.44	0.69	0.72	0.72	0.46	1.17	0.09	7.6	7.8	120	123
Mall	Lead	80%	0%	10%	0%	10%	0%	6%	0.40	0.05	0.44	0.22	0.37	0.06	1.17	0.09	1.6	3.3	41	82
	Manganese	80%	0%	10%	0%	10%	0%	6%	4.43	0.16	6.48	2.48	1.01	0.14	1.17	0.09	179	348	473	919
	Mercury	80%	0%	10%	0%	10%	0%	6%	0.11	0.25	0.39	0.27	0.47	0.75	1.17	0.09	0.023	0.068	1	3.3
	Nickel	80%	0%	10%	0%	10%	0%	6%	0.20	0.88	0.39	0.59	0.59	1.16	1.17	0.09	6.7	8.2	243	295
	Vanadium	80%	0%	10%	0%	10%	0%	6%	0.25	0.07	0.22	0.17	0.26	0.13	1.17	0.09	0.34	0.70	13	26
	tPCB (mid-range sensitivity)	0%	100%	0%	0%	0%	0%	0%	0.42	3.80	0.92	0.75	6.50	3.40	0.02	0.24	0.47	1.4	0.51	1.5
	tPCB (high sensitivity)	0%	100%	0%	0%	0%	0%	0%	0.42	3.80	0.92	0.75	6.50	3.40	0.02	0.24	0.043	0.13	0.048	0.14
	Barium	0%	100%	0%	0%	0%	0%	0%	1.59	0.16	0.86	3.26	0.72	0.20	0.02	0.24	21	42	542	1086
>	Chromium	0%	100%	0%	0%	0%	0%	0%	0.20	0.57	0.23	0.14	0.73	0.13	0.02	0.24	2.7	2.8	19	20
Swallow	Cobalt	0%	100%	0%	0%	0%	0%	0%	0.66	0.44	0.69	0.72	0.72	0.46	0.02	0.24	7.6	7.8	72	74
Tree S	Lead	0%	100%	0%	0%	0%	0%	0%	0.40	0.05	0.44	0.22	0.37	0.06	0.02	0.24	1.63	3.3	136	272
-	Manganese	0%	100%	0%	0%	0%	0%	0%	4.43	0.16	6.48	2.48	1.01	0.14	0.02	0.24	179	348	4661	9063
	Mercury	0%	100%	0%	0%	0%	0%	0%	0.11	0.25	0.39	0.27	0.47	0.75	0.02	0.24	0.023	0.068	0.4	1
	Nickel	0%	100%	0%	0%	0%	0%	0%	0.20	0.88	0.39	0.59	0.59	1.16	0.02	0.24	6.7	8.2	32	39
	Vanadium	0%	100%	0%	0%	0%	0%	0%	0.25	0.07	0.22	0.17	0.26	0.13	0.02	0.24	0.34	0.70	20	42

### Table 6-1 **Avian Site-Specific Risk-Based Concentration Calculations**

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

				Perc	ent Diet (	%)						ılation Factors /dw sediment)			Body Weight (kg)	Normalized Ingestion Rate (kg dw/kg bw/d)	TF (mg/l			RBC sediment)
Aquatic Receptors	Constituent	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Amphibians	Sediment	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Amphibians	BW	IR	NOAEL TRV	LOAEL TRV	NOAEL SSRBC	LOAEL SSRBC
	tPCB (mid-range sensitivity)	0%	50%	50%	0%	0%	0%	18%	0.42	3.80	0.92	0.75	6.50	3.40	0.04	0.18	0.47	1.4	1.0	3.1
	tPCB (high sensitivity)	0%	50%	50%	0%	0%	0%	18%	0.42	3.80	0.92	0.75	6.50	3.40	0.04	0.18	0.043	0.13	0.1	0.3
	Barium	0%	50%	50%	0%	0%	0%	18%	1.59	0.16	0.86	3.26	0.72	0.20	0.04	0.18	21	42	169	340
iper	Chromium	0%	50%	50%	0%	0%	0%	18%	0.20	0.57	0.23	0.14	0.73	0.13	0.04	0.18	2.7	2.8	26	27
Sandpiper	Cobalt	0%	50%	50%	0%	0%	0%	18%	0.66	0.44	0.69	0.72	0.72	0.46	0.04	0.18	7.6	7.8	57	59
Spotted S	Lead	0%	50%	50%	0%	0%	0%	18%	0.40	0.05	0.44	0.22	0.37	0.06	0.04	0.18	1.63	3.3	22	43
Spo	Manganese	0%	50%	50%	0%	0%	0%	18%	4.43	0.16	6.48	2.48	1.01	0.14	0.04	0.18	179	348	287	559
	Mercury	0%	50%	50%	0%	0%	0%	18%	0.11	0.25	0.39	0.27	0.47	0.75	0.04	0.18	0.023	0.068	0.3	0.8
	Nickel	0%	50%	50%	0%	0%	0%	18%	0.20	0.88	0.39	0.59	0.59	1.16	0.04	0.18	6.7	8.2	46	56
	Vanadium	0%	50%	50%	0%	0%	0%	18%	0.25	0.07	0.22	0.17	0.26	0.13	0.04	0.18	0.34	0.70	6	12
	tPCB (mid-range sensitivity)	10%	5%	53%	20%	2%	10%	6%	0.42	3.80	0.92	0.75	6.50	3.40	0.42	0.07	0.47	1.4	5	14
	tPCB (high sensitivity)	10%	5%	53%	20%	2%	10%	6%	0.42	3.80	0.92	0.75	6.50	3.40	0.42	0.07	0.043	0.13	0.4	1
	Barium	10%	5%	53%	20%	2%	10%	6%	1.59	0.16	0.86	3.26	0.72	0.20	0.42	0.07	21	42	214	429
Grebe	Chromium	10%	5%	53%	20%	2%	10%	6%	0.20	0.57	0.23	0.14	0.73	0.13	0.42	0.07	2.7	2.8	131	138
ed Gre	Cobalt	10%	5%	53%	20%	2%	10%	6%	0.66	0.44	0.69	0.72	0.72	0.46	0.42	0.07	7.6	7.8	149	153
Pied-Billed	Lead	10%	5%	53%	20%	2%	10%	6%	0.40	0.05	0.44	0.22	0.37	0.06	0.42	0.07	1.63	3.3	58	117
Pie	Manganese	10%	5%	53%	20%	2%	10%	6%	4.43	0.16	6.48	2.48	1.01	0.14	0.42	0.07	179	348	563	1095
	Mercury	10%	5%	53%	20%	2%	10%	6%	0.11	0.25	0.39	0.27	0.47	0.75	0.42	0.07	0.023	0.068	0.7	2
	Nickel	10%	5%	53%	20%	2%	10%	6%	0.20	0.88	0.39	0.59	0.59	1.16	0.42	0.07	6.7	8.2	164	199
	Vanadium	10%	5%	53%	20%	2%	10%	6%	0.25	0.07	0.22	0.17	0.26	0.13	0.42	0.07	0.34	0.70	19	38

### **Acronyms and Abbreviations:**

ADD<sub>pot</sub> = potential average daily dose

BW = body weight

dw = dry weight IR = ingestion rate

kg = kilogram

kg dw/kg bw/d = kilogram dry weight per kilogram body weight per day LOAEL = lowest observed adverse effect level

mg/kg = milligram per kilogram

mg/kg d = milligram per kilogram per day NOAEL = no observed adverse effect level OU = Operable Unit SSRBC = site-specific risk-based concentration tPCB = total polychlorinated biphenyl TRV = toxicity reference value

### Table 6-2 Mammalian Site-Specific Risk-Based Concentration Calculations

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

					Percent	: Diet (%)					Bioa	ccumulation Facto	ors (dw tissu	ıe/dw sedim	ent)		Body Weight (kg)	Normalized Ingestion Rate (kg dw/kg bw/d)	TRV (m	ng/kg d)		RBC sediment)
Aquatic Receptors	Constituent	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Frogs	Snakes	Sediment	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Frogs	Snakes	BW	IR	NOAEL TRV	LOAEL TRV	NOAEL SSRBC	LOAEL SSRBC
	tPCB	90%	0%	5%	0%	5%	0%	0%	9%	0.42	3.80	0.92	0.75	6.50	3.40	26.91	1.10	0.07	0.23	0.68	4	12
	Barium	90%	0%	5%	0%	5%	0%	0%	9%	1.59	0.16	0.86	3.26	0.72	0.20	0.92	1.10	0.07	52	121	474	1106
	Chromium	90%	0%	5%	0%	5%	0%	0%	9%	0.20	0.57	0.23	0.14	0.73	0.13	0.95	1.10	0.07	2.4	2.8	109	128
at	Cobalt	90%	0%	5%	0%	5%	0%	0%	9%	0.66	0.44	0.69	0.72	0.72	0.46	0.26	1.10	0.07	7.3	10	142	193
Muskr	Lead	90%	0%	5%	0%	5%	0%	0%	9%	0.40	0.05	0.44	0.22	0.37	0.06	0.37	1.10	0.07	4.7	8.9	140	265
2	Manganese	90%	0%	5%	0%	5%	0%	0%	9%	4.43	0.16	6.48	2.48	1.01	0.14	1.37	1.10	0.07	52	65	169	214
	Mercury	90%	0%	5%	0%	5%	0%	0%	9%	0.11	0.25	0.39	0.27	0.47	0.75	1.11	1.10	0.07	0.075	0.15	5	9
	Nickel	90%	0%	5%	0%	5%	0%	0%	9%	0.20	0.88	0.39	0.59	0.59	1.16	1.16	1.10	0.07	1.7	3.4	77	154
	Vanadium	90%	0%	5%	0%	5%	0%	0%	9%	0.25	0.07	0.22	0.17	0.26	0.13	0.13	1.10	0.07	4.2	8.3	178	355
	tPCB	0%	100%	0%	0%	0%	0%	0%	0%	0.42	3.80	0.92	0.75	6.50	3.40	26.91	0.01	0.18	0.23	0.68	0	1
	Barium	0%	100%	0%	0%	0%	0%	0%	0%	1.59	0.16	0.86	3.26	0.72	0.20	0.92	0.01	0.18	52	121	1819	4249
Ħ	Chromium	0%	100%	0%	0%	0%	0%	0%	0%	0.20	0.57	0.23	0.14	0.73	0.13	0.95	0.01	0.18	2.4	2.8	24	28
vn Ba	Cobalt	0%	100%	0%	0%	0%	0%	0%	0%	0.66	0.44	0.69	0.72	0.72	0.46	0.26	0.01	0.18	7.3	10	94	128
e Bro	Lead	0%	100%	0%	0%	0%	0%	0%	0%	0.40	0.05	0.44	0.22	0.37	0.06	0.37	0.01	0.18	4.7	8.9	528	1000
Little	Manganese	0%	100%	0%	0%	0%	0%	0%	0%	4.43	0.16	6.48	2.48	1.01	0.14	1.37	0.01	0.18	52	65	1808	2282
	Mercury	0%	100%	0%	0%	0%	0%	0%	0%	0.11	0.25	0.39	0.27	0.47	0.75	1.11	0.01	0.18	0.075	0.15	2	3
	Nickel	0%	100%	0%	0%	0%	0%	0%	0%	0.20	0.88	0.39	0.59	0.59	1.16	1.16	0.01	0.18	1.7	3.4	11	22
	Vanadium	0%	100%	0%	0%	0%	0%	0%	0%	0.25	0.07	0.22	0.17	0.26	0.13	0.13	0.01	0.18	4.2	8.3	334	667
	tPCB	44%	0%	13%	15%	13%	10%	5%	9%	0.42	3.80	0.92	0.75	6.50	3.40	26.91	5.60	0.03	0.23	0.68	3	8
	Barium	44%	0%	13%	15%	13%	10%	5%	9%	1.59	0.16	0.86	3.26	0.72	0.20	0.92	5.60	0.03	52	121	1235	2884
	Chromium	44%	0%	13%	15%	13%	10%	5%	9%	0.20	0.57	0.23	0.14	0.73	0.13	0.95	5.60	0.03	2.4	2.8	229	269
uoo	Cobalt	44%	0%	13%	15%	13%	10%	5%	9%	0.66	0.44	0.69	0.72	0.72	0.46	0.26	5.60	0.03	7.3	10	370	504
Raccoo	Lead	44%	0%	13%	15%	13%	10%	5%	9%	0.40	0.05	0.44	0.22	0.37	0.06	0.37	5.60	0.03	4.7	8.9	403	763
	Manganese	44%	0%	13%	15%	13%	10%	5%	9%	4.43	0.16	6.48	2.48	1.01	0.14	1.37	5.60	0.03	52	65	549	693
	Mercury	44%	0%	13%	15%	13%	10%	5%	9%	0.11	0.25	0.39	0.27	0.47	0.75	1.11	5.60	0.03	0.075	0.15	7	13
	Nickel	44%	0%	13%	15%	13%	10%	5%	9%	0.20	0.88	0.39	0.59	0.59	1.16	1.16	5.60	0.03	1.70	3.4	110	220
	Vanadium	44%	0%	13%	15%	13%	10%	5%	9%	0.25	0.07	0.22	0.17	0.26	0.13	0.13	5.60	0.03	4.2	8.3	495	988

### Acronyms and Abbreviations:

ADD<sub>pot</sub> = potential average daily dose
BW = body weight
dw = dry weight
IR = ingestion rate
kg = kilogram

kg dw/kg bw/d = kilogram dry weight per kilogram body weight per day LOAEL = lowest observed adverse effect level

mg/kg = milligram per kilogram

mg/kg d = milligram per kilogram per day
NOAEL = no observed adverse effect level
OU = Operable Unit
SSRBC = site-specific risk-based concentration
tPCB = total polychlorinated biphenyl
TRV = toxicity reference value

Table 6-3
Summary of Benthic Invertebrate Benchmarks/Toxicity Values and Avian and Mammalian Site-Specific Risk-Based Concentrations<sup>1</sup>

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

	Low Benchmarks/ Toxicity Values <sup>2</sup>			NOAEL Site-Sp	ecific Risk-Based	d Concentratio	ns	
Constituent	Benthic Invertebrates	Mallard	Tree Swallow	Spotted Sandpiper	Pied-Billed Grebe	Muskrat	Little Brown Bat	Raccoon
tPCB (mid-range sensitivity)	1	5	1	1	5	4	0.3	3
tPCB (high sensitivity)	nc	0.4	0.05	0.1	0.4	na	na	na
Barium	nc	160	542	169	214	474	1819	1235
Chromium	43	97	19	26	131	109	24	229
Cobalt	50	120	72	57	149	142	94	370
Lead	36	41	136	22	58	140	528	403
Manganese	nc	473	4661	287	563	169	1808	549
Mercury	0.2	1	0.3	0.3	0.7	5	2	7
Nickel	23	243	32	46	164	77	11	110
Vanadium	nc	13	20	5.9	19	178	334	495
	High Benchmarks/ Toxicity Values <sup>2</sup>			LOAEL Site-Sp	ecific Risk-Based	l Concentration	ns	
tPCB (mid-range sensitivity)	4	14	2	3	14	12	1	8
tPCB (high sensitivity)	nc	1	0.1	0.3	1	na	na	na
Barium	nc	322	1086	340	429	1106	4249	2884
Chromium	111	102	20	27	138	128	28	269
Cobalt	nc	123	74	59	153	193	128	504
Lead	128	82	272	43	117	265	1000	763
Manganese	nc	919	9063	559	1095	214	2282	693
Mercury	1	3	1	8.0	2	9	3	13
Nickel	49	295	39	56	199	154	22	220
Vanadium	nc	26	42	12	38	355	667	988

#### Footnotes:

#### **Acronyms and Abbreviations:**

LOAEL = lowest observed adverse effect level mg/kg = milligram per kilogram na = not applicable nc = no criteria available NOAEL = no observed adverse effect level OU = Operable Unit tPCB = total polychlorinated biphenyl

<sup>&</sup>lt;sup>1</sup>All Values are mg/kg sediment

<sup>&</sup>lt;sup>2</sup>Benthic Invertebrate values for tPCBs represent EC0 and EC20 values for most sensitive species and endpoint from site-specific toxicity testing

### Table 6-4 Summary of Benchmark/Toxicity Value and SSRBC Exceedances

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

	Low Benchmark/ Toxicity Value Comparisions	NOAEL SSRBC Comparisons (percent of samples exceeding SSRBC)						
Constituent	Benthic Invertebrate	Mallard	Tree Swallow	Spotted Sandpiper	Pied-Billed Grebe	Muskrat	Little Brown Bat	Raccoon
tPCB (mid-range sensitivity)	74%	44%	100%	88%	44%	49%	100%	58%
tPCB (high sensitivity)	na	100%	100%	100%	100%	na	na	na
Barium	nc	33%	8%	33%	17%	8%	0%	0%
Chromium	58%	33%	100%	100%	33%	33%	100%	17%
Cobalt	8%	0%	8%	8%	0%	0%	0%	0%
Lead	67%	67%	8%	92%	42%	8%	0%	8%
Manganese	nc	92%	0%	100%	83%	100%	33%	83%
Mercury	67%	8%	25%	42%	17%	0%	8%	0%
Nickel	33%	0%	25%	25%	0%	17%	100%	0%
Vanadium	nc	83%	50%	92%	67%	0%	0%	0%
	High Benchmark/ Toxicity Value Comparisions							
tPCB (mid-range sensitivity)	47%	19%	72%	58%	19%	23%	88%	35%
tPCB (high sensitivity)	na	79%	100%	100%	79%	na	na	na
Barium	nc	8%	0%	8%	8%	0%	0%	0%
Chromium	33%	33%	100%	100%	33%	33%	100%	17%
Cobalt	nc	0%	8%	8%	0%	0%	0%	0%
Lead	8%	17%	8%	67%	17%	8%	0%	0%
Manganese	nc	50%	0%	83%	50%	100%	17%	75%
Mercury	8%	0%	8%	17%	0%	0%	0%	0%
Nickel	25%	0%	25%	17%	0%	0%	42%	0%
Vanadium	nc	25%	25%	83%	25%	0%	0%	0%

#### **Acronyms and Abbreviations:**

tPCB = total polychlorinated biphenyl

LOAEL = lowest observed adverse effect level
na = not applicable
nc = no criteria available
NOAEL = no observed adverse effect level
OU = Operable Unit
SSRBC = Site-specific risk-based concentration

95% upper confidence limit (UCL) concentration exceeds SSRBC

#### Table 6-5

# Summary of Avian and Mammalian Site-Specific Risk-Based Concentrations and Percent Sample Exceedances Laboratory Bioaccumulation Scenario

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

Constituent NOAEL Site-Specific Risk-Bas	Mallard ed Concentration	Spotted Sandpiper ns (mg/kg)	Pied-Billed Grebe	Muskrat	Raccoon		
tPCB (mid-range sensitivity)	2 (67%)	0.2 (100%)	0.5 (100%)	2 (72%)	1 (88%)		
tPCB (high sensitivity)	0.2 (100%)	0.02 (100%)	0.05 (100%)	na	na		
LOAEL Site-Specific Risk-Bas	LOAEL Site-Specific Risk-Based Concentrations (mg/kg)						
tPCB (mid-range sensitivity)	5 (44%)	0.6 (100%)	2 (72%)	5 (44%)	3 (58%)		
tPCB (high sensitivity)	0.5 (100%)	0.05 (100%)	0.1 (100%)	na	na		

#### **Acronyms and Abbreviations:**

LOAEL = lowest observed adverse effect level

mg/kg = milligram per kilogram

na = no criteria available

NOAEL = no observed adverse effect level

OU = Operable Unit

tPCB = total polychlorinated biphenyl

# Table 6-6 Mallard and Muskrat Alternative Site-Specific Risk-Based Concentrations Omnivorous Dietary Composition

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

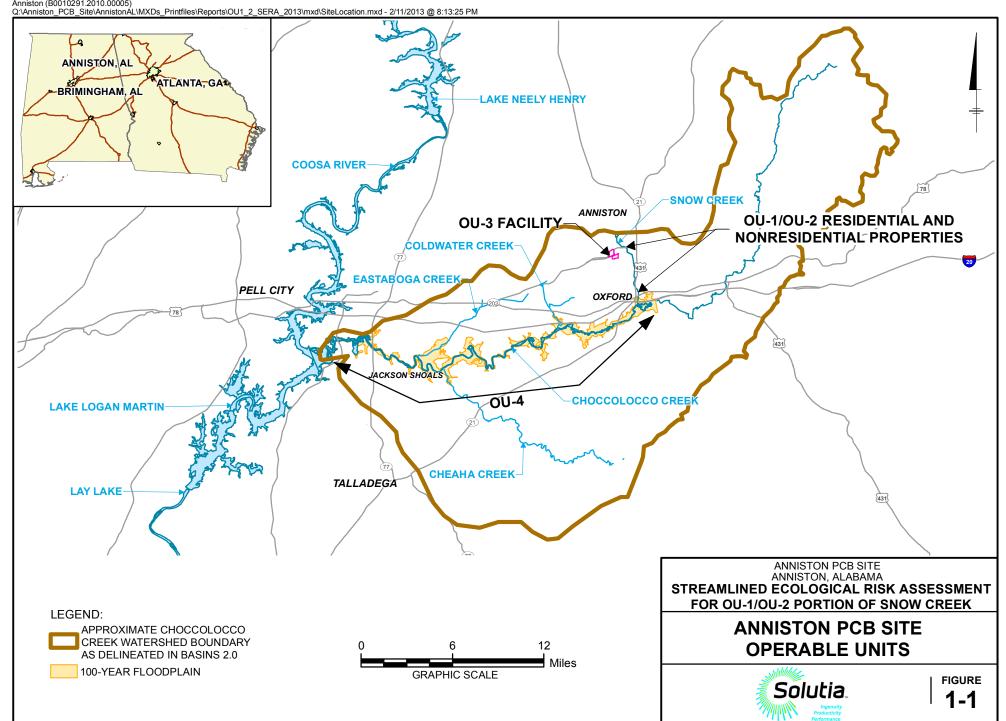
NOAEL Site-Specific Risk-Based Concentrations (mg/kg)							
	Mal	lard	Muskrat				
Constituent	Herbivore	Omnivore	Herbivore	Omnivore			
tPCB (mid-range sensitivity)	5	3	4	2			
tPCB (high sensitivity)	0.4	0.2	na	na			
Barium	160	182	474	515			
Chromium	97	64	109	88			
Cobalt	120	127	142	140			
Lead	41	56	140	141			
Manganese	473	922	169	192			
Mercury	1	8.0	5	3.8			
Nickel	243	130	77	65			
Vanadium	13	16	178	177			
LOAEL Site-Specific Risk-Based Concentrations (mg/kg)							
tPCB (mid-range sensitivity)	14	8	12	6			
tPCB (high sensitivity)	1	0.7	na	na			
Barium	322	366	1106	1204			
Chromium	102	67	128	103			
Cobalt	123	131	193	191			
Lead	82	112	265	267			
Manganese	919	1792	214	242			
Mercury	3	2.4	9	8			
Nickel	295	158	154	131			
Vanadium	26	32	355	354			

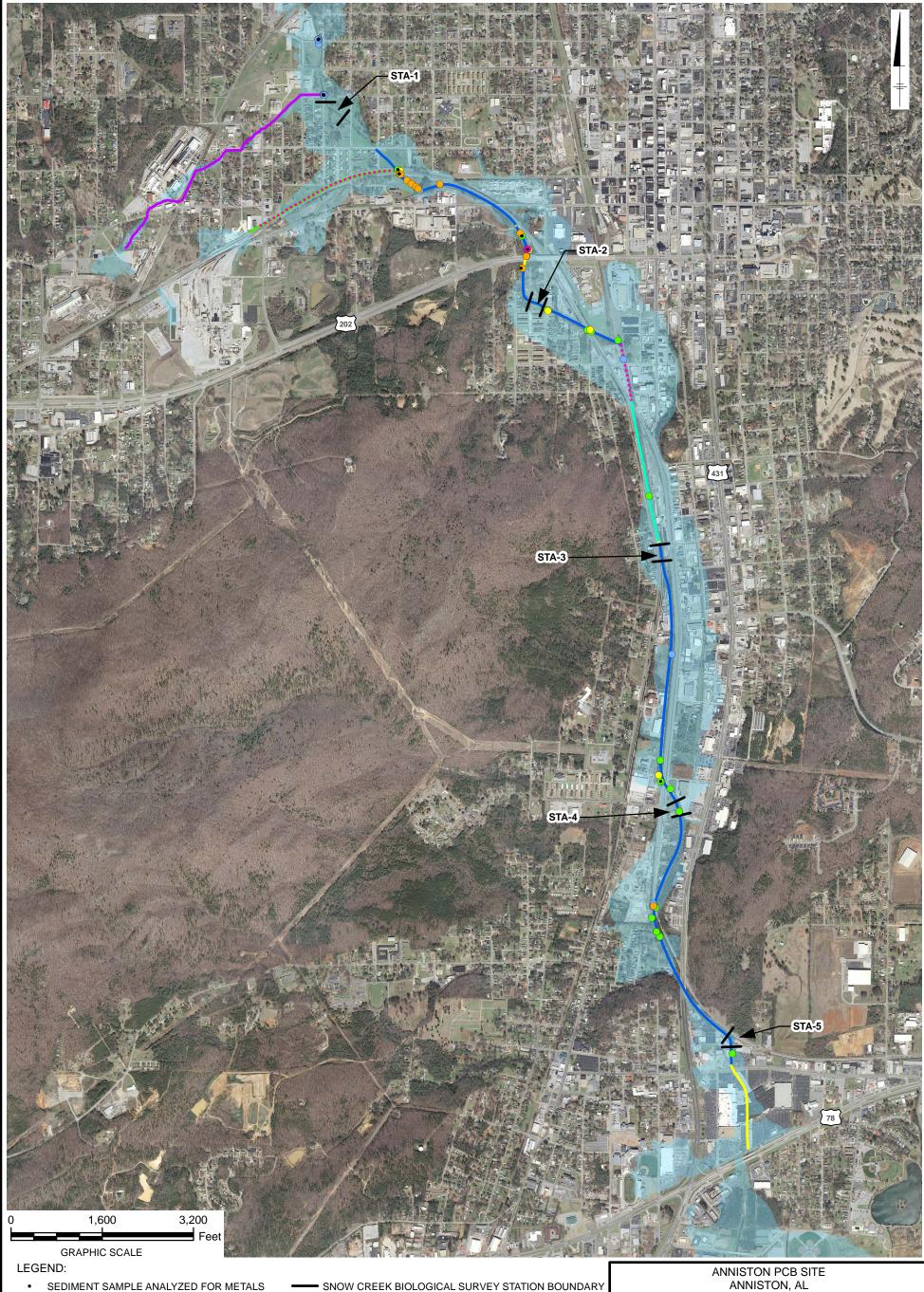
### **Acronyms and Abbreviations:**

LOAEL = lowest observed adverse effect level mg/kg = milligram per kilogram na = no criteria available NOAEL = no observed adverse effect level OU = Operable Unit tPCB = total polychlorinated biphenyl



**Figures** 





SEDIMENT SAMPLE ANALYZED FOR METALS SEDIMENT SAMPLE LOCATION

- MAX PCB RESULT (mg/kg) < 1.0
- 1.0 5.0
- 5.0 10
- 10 50
- > 50

- - \*\*\*\* APPROXIMATE EXTENT OF CONCRETE LINED CHANNEL
  - CULVERT
  - NATURAL
  - NATURAL BOTTOM EAST WALL CONCRETE
  - 11th STREET DITCH
  - WEST 9th STREET DITCH OU-1/OU-2 100-YR FLOODPLAIN
  - **STA-5** BIOLOGICAL SAMPLING STATION LOCATIONS

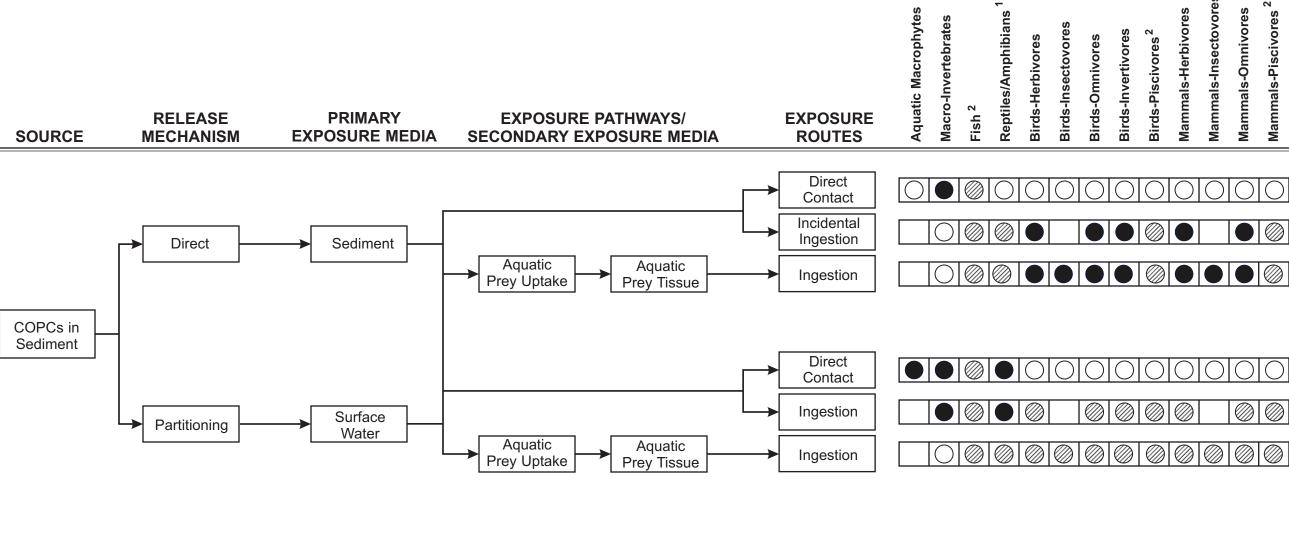
ANNISTON, AL
STREAMLINED ECOLOGICAL RISK ASSESSMENT
FOR OU-1/OU-2 PORTION OF SNOW CREEK

BIOLOGICAL SURVEY SITE LOCATIONS AND PCB SAMPLE LOCATIONS FOR OU-1/OU-2 SEDIMENT



**FIGURE** 2-1

# AQUATIC OU-1/OU-2 PORTION OF SNOW CREEK



= High potential for complete exposure pathway.
Primary Pathway quantitatively evaluated.

= Secondary pathway complete but expected to be minimal relative to the identified Primary

1 = Pathway may be complete but insufficient toxicity data available. Not quantitatively evaluated.

complete pathways. Not quantitatively evaluated.

= Exposure pathway considered *de minimus*.

Not quantitatively evaluated.

= Incomplete exposure pathway.

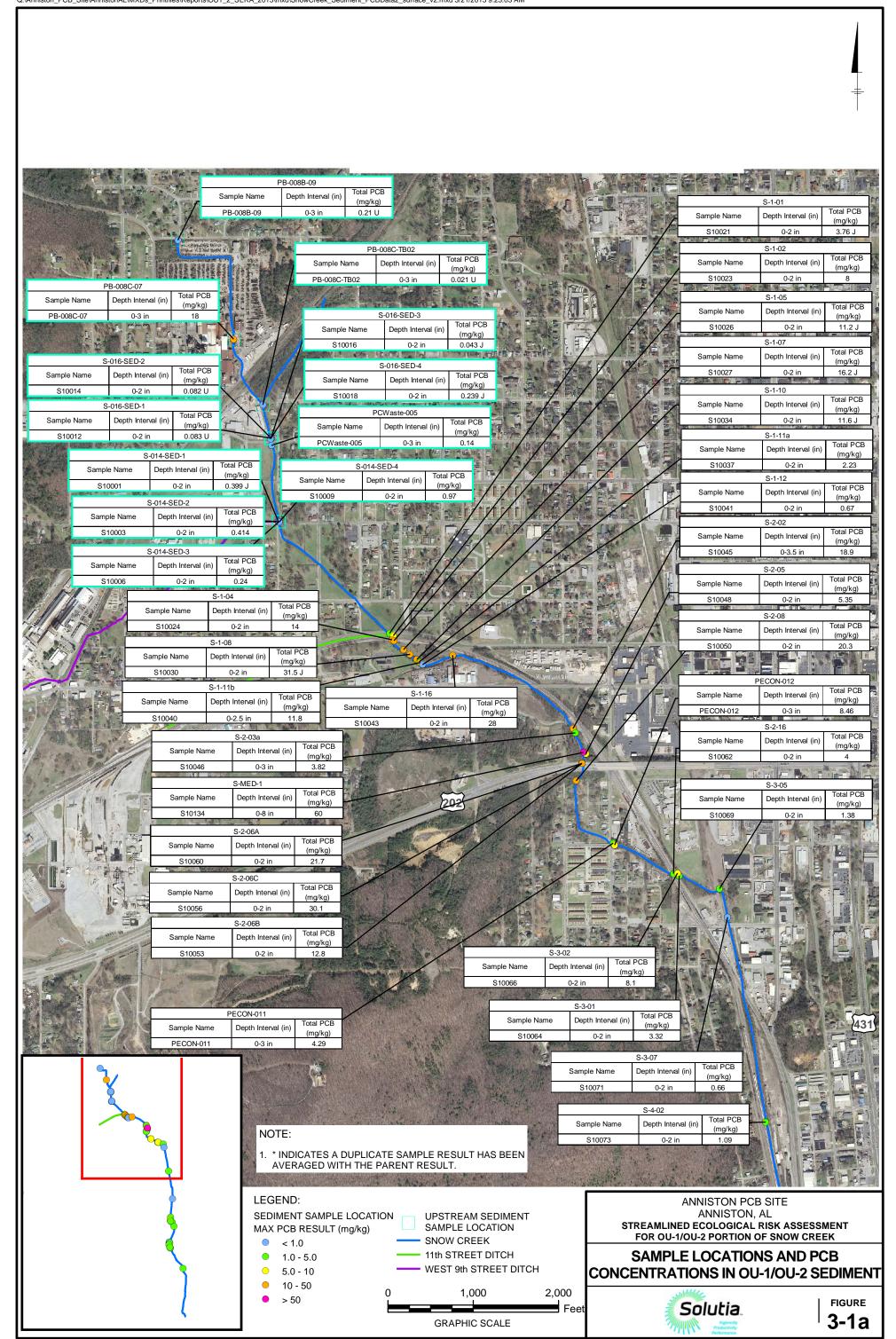
2 = Pathway considered secondary because minimal fish community present.

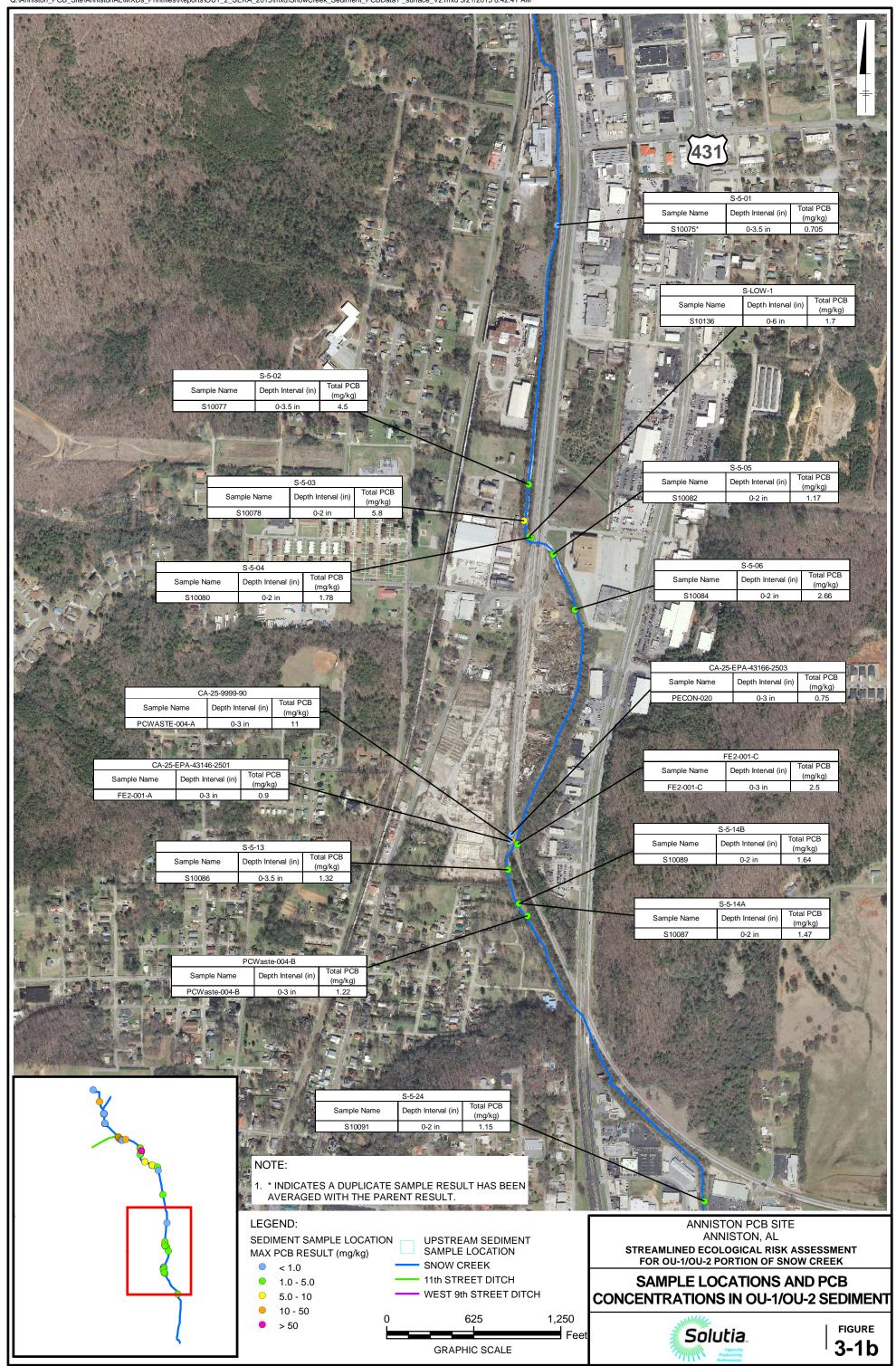
ANNISTON PCB SITE ANNISTON, ALABAMA

STREAMLINED ECOLOGICAL RISK ASSESSMENT FOR THE OU-1/OU-2 PORTION OF SNOW CREEK

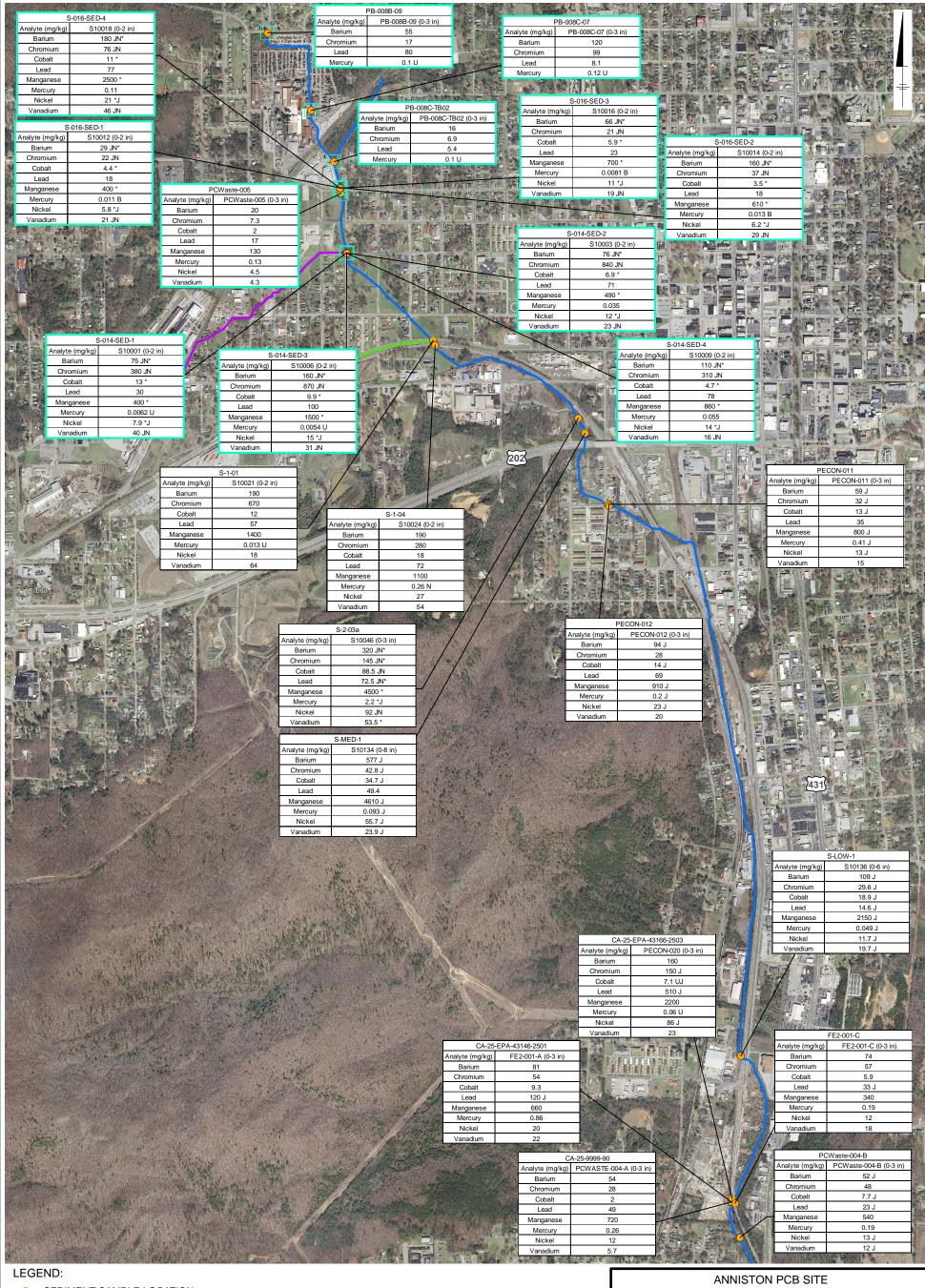
**AQUATIC CONCEPTUAL SITE MODEL** 







City: SYR Div/Group: SWG Created By: Last Saved By: kives Anniston (B0010291.2010.00005)
Q:\Anniston\_PCB\_Site\AnnistonAL\MXDs\_Printfiles\Reports\OU1\_2\_SERA\_2013\mxd\SnowCreek\_Sediment\_MetalsData\_surface\_v2.mxd 5/21/2013 9:46:51 AM



SEDIMENT SAMPLE LOCATION

**UPSTREAM SEDIMENT SAMPLE LOCATION** 

SNOW CREEK

11th STREET DITCH

WEST 9th STREET DITCH

### NOTE:

1. \* INDICATES A DUPLICATE SAMPLE RESULT HAS BEEN AVERAGED WITH THE PARENT RESULT.

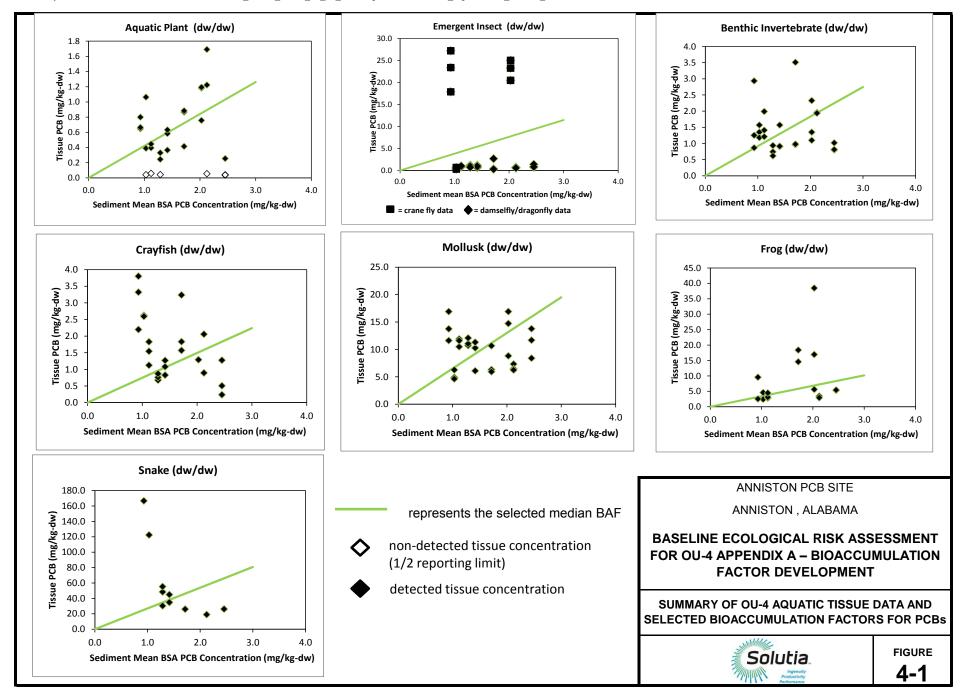
1,350 2,700 Feet **GRAPHIC SCALE** 

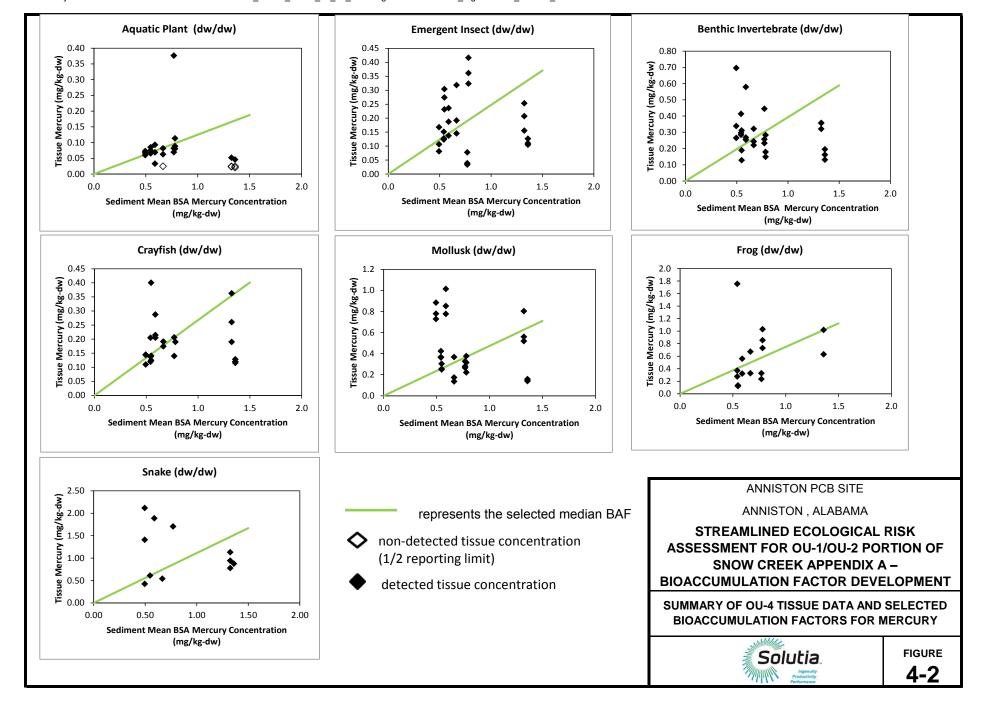
ANNISTON, AL STREAMLINED ECOLOGICAL RISK ASSESSMENT FOR OU-1/OU-2 PORTION OF SNOW CREEK

SAMPLE LOCATIONS AND METAL **CONCENTRATIONS IN OU-1/OU-2 SEDIMENT** 



**FIGURE** 3-2







Bioaccumulation Factor Development



Pharmacia LLC and Solutia Inc.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek

Appendix A: Bioaccumulation Factor Development

Anniston PCB Site, Anniston, Alabama

December 2013 Revision 2

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PCB - Crayfish Tissue Uptake Summary





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### **Attachment**

A Statistical Evaluation of Regression Analyses

### **Table of Contents**



### **Acronyms and Abbreviations**

ANOVA analysis of variance

ARCADIS ARCADIS U.S., Inc.

BAF bioaccumulation factor

BSA biological sampling area

BSAF biota sediment accumulation factor

COPC constituent of potential concern

dw dry weight

EDR ecologically distinct reach

FSP Field Sampling Plan

mg/kg milligrams per kilogram

ND non-detect

OC organic carbon

OU Operable Unit

p probability of Type 1 error

PCB polychlorinated biphenyl

r<sup>2</sup> coefficient of determination

SERA Streamlined Ecological Risk Assessment

ww wet weight



Bioaccumulation Factor Development

#### 1. Introduction

The Operable Unit (OU)-1/OU-2 Streamlined Ecological Risk Assessment (SERA) was conducted to evaluate the aquatic exposure pathways for ecological receptors and potential risks associated with identified constituents of potential concern (COPCs) (polychlorinated biphenyls [PCBs], barium, chromium, cobalt, lead, manganese, mercury, nickel and vanadium) within the OU-1/OU-2 portion of Snow Creek. Dietary exposure to a range of feeding guilds of birds and mammals was evaluated based on exposure from sediment and contaminated prey tissues. To evaluate the dietary exposure pathways to aquatic-feeding receptors, COPC concentrations in tissues of the prey for the identified receptors were modeled. The prey items for the representative receptors selected for evaluation in the OU-1/OU-2 SERA were aquatic plants, benthic invertebrates, emergent insects, crayfish, mollusks, frogs, and snakes. Table A-1 summarizes the aquatic receptors that are evaluated in the SERA and the assumed dietary components of each receptor's diet.

Table A-1 OU-1/OU-2 Aquatic Receptors and Dietary Components

Receptor	Aquatic Plants	Emergent and Flying Insects	Benthic Invertebrates	Crayfish	Mollusk	Frog	Snake
Mallard	X		X		X		
Tree Swallow		Х					
Spotted Sandpiper		Х	Х				
Pied-Billed Grebe	Х	Х	Х	Х	Х	X	
Common Muskrat	Х		Х		Х		
Little Brown Bat		Х					
Raccoon	Х		X	Х	X	Х	Х

Biotic tissue data and sediment data were collected from nine biological sampling areas (BSAs) and three reference areas as a part of the Phase II field sampling in 2009. These data were collected primarily to support the evaluation of potential risk to the identified ecological receptors from dietary exposure in OU-4. Details of the approach for this sampling are provided in the OU-4 Phase II Field Sampling Plan (FSP) (ARCADIS U.S., Inc. [ARCADIS] 2009). The data collected and used herein are described in Section 2.1 below and in Section 3.2 of the SERA, to which this document is an appendix.



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The bioaccumulation model represents the relationship between the abiotic media (in this case, creek sediment) and the measured prey tissue concentration. When available data are sufficient, a regression analysis to predict tissue concentrations as a function of the abiotic media concentration is preferred. The regression takes the form (e.g., for a linear model):

tissue concentration (y) = slope (m) of the line x exposed sediment concentration (x) + the y intercept (b)

If sufficient data are not available or if regression analyses do not result in a predictive relationship between abiotic media and tissue (i.e., not statistically significant or low coefficient of determination  $[r^2]$  values), prey tissue concentrations can be estimated using bioaccumulation factors (BAFs) that relate concentrations in abiotic media to tissue concentrations through a simple ratio. As a convention herein, ratios based on wet weight (ww) or dry weight (dw) tissue and abiotic media concentrations are referred to as BAFs. Ratios based on lipid normalized tissue and organic carbon normalized sediment are referred to as biota sediment accumulation factors (BSAFs).

As an example, a BAF can be calculated as follows:

Equation 1: 
$$C_{insect} = BAF_{insect} \times PCB_{sediment}$$

When BAFs are used, the predictability of the selected BAF is acknowledged to be uncertain due to the lack of relationship between the sediment and tissue data in the regression analysis. The approach for development of BAFs or regressions for PCBs and mercury was different than the approach used to develop BAFs for the remaining metals, due to differences in the available data for each. The following sections describe the data and analyses used to estimate bioaccumulation for each prey tissue type and COPC.

### 2. PCB and Mercury BAF Development

For the SERA, conditions influencing bioaccumulation of PCBs and mercury in prey tissues in the OU-1/OU-2 portion of Snow Creek were assumed to be similar to those already assessed in OU-4. There is some uncertainty associated with this assumption because the creek and adjacent floodplain within the OU-1/OU-2 portion of Snow Creek are in a more developed/industrialized area than OU-4. Thus, prey species that are present as well as the make up of the sediments may differ. While these differences do introduce some uncertainty, these data likely introduce less uncertainty than non-site-specific values in the peer reviewed literature and are thus preferred for the SERA. BAFs developed for PCBs and mercury in OU-4 are, therefore, considered reasonably representative of OU-1/OU-2. The following sections detail the data used and the approach for development of PCB and mercury BAFs in OU-4.



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#### 2.1 Data Use

Three ecologically distinct reaches (EDRs), upper, middle, and lower, were identified within OU-4 based on habitat surveys conducted in Phase I Ecological Survey (ARCADIS BBL 2007). Three aquatic BSAs were identified within each of the three EDRs for a total of nine aquatic BSAs within OU-4. Samples were also collected from three aquatic reference locations. Six discrete sediment samples were collected from each BSA and reference location. Four field duplicates were collected, one in each EDR and one in the reference location. Field duplicates were averaged for the purposes of this analysis. In addition to the sediment data collected as a part of the biota investigation, 13 historical sediment samples were identified that were collected within or in close proximity to the BSAs. These samples were also included in the sediment datasets for the BSAs. Tables A-2 and A-3 summarize the sediment and biotic tissue for PCBs and mercury, respectively. Figures A-1 through A-9 show the locations of each BSA as well as the locations of the sediment data collected within or in close proximity to each BSA.

In general, individual biotic tissue samples were not precisely co-located with specific sediment samples, rather tissue collected from specified locations within a BSA were composited. Thus, associating a specific tissue sample within a BSA with a specific sediment sample location was not possible. As such, samples were not evaluated on an individual basis. Instead, data from each BSA or reference area were combined to estimate a mean value for each sub-area. These mean values were used to develop bioaccumulation models. To calculate the means for each BSA, all available sediment and tissue data were initially included. When none of the samples collected within a BSA had a detected PCB or mercury concentration (all were non-detect [ND]), that BSA was not used in calculating BAFs; however when at least one sample contained a detected concentration, one-half the reporting limit was used for ND values in conjunction with the detected concentration to calculate a mean value. This approach is expected to adequately account for and represent the spatial variability of measured concentrations within a BSA. PCBs were not detected in sediment at any of the three reference locations. Mercury was detected in a small number of reference area sediments. However, a statistical comparison of means was conducted comparing site and reference location sediment. The dataset did not meet the normality assumptions needed to conduct an analysis of variance (ANOVA) test; therefore, the non-parameter Kruskal-Wallis test was used for the comparison of means. Using the Kruskal-Wallis test, it was determined that site sediment is statistically different from reference locations and, therefore, these data are considered to represent two populations. As such, only the site data were included in the BAF analysis for PCBs and mercury. The calculated BSA means for PCBs and mercury for sediment and tissue are shown in Tables A-4 through A-19.

In addition to the field collected benthic invertebrate data, a laboratory bioaccumulation test was conducted using *lumbriculus verigatus* and site sediments containing a range of PCB concentrations. The specific methods and results for the laboratory bioaccumulation study are provided in the final report from the laboratory (Ingersoll et al, in review). Laboratory sediments were analyzed as both homologs and Aroclors. Tissue was measured as homologs and is provided as wet weight. The laboratory bioaccumulation data for



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homologs and Aroclors are summarized in Tables A-10 and A-11, respectively. Additional detail regarding data for each prey-tissue type is described in Section 2.2.

### 2.2 BAF Development Methods

As described above, a regression analysis to predict tissue concentrations as a function of the abiotic media concentration is preferred. Because the tissues and sediments were not specifically co-located (beyond being collected within the area of the BSA), regression analyses were conducted for each tissue type using mean tissue concentrations and mean sediment concentrations for each BSA as described in Section 2.1. Initially, regression analyses based on dry weight sediment and tissue were conducted for PCBs and mercury, as well as organic carbon<sup>2</sup> (dw) sediment and lipid normalized (ww) tissue for PCBs. Fit was tested on a linear and lognormal basis. The results of these analyses are shown in Tables A-4 through A-19 and Figures A-10 through A-25. As these regression analyses did not result in a predictive relationship between sediment and biotic tissue (i.e., coefficient of determination r<sup>2</sup> values < 0.3), further analysis was conducted to evaluate possible correlations based on a range of variations in sediment and tissue estimates. Additional sediment variations include fines normalized dry weight sediment. In general, sediment PCBs were measured as Aroclors. In a subset of samples in six of the nine BSAs, PCBs were measured as homologs. These data were also considered in the correlation analysis. Tissue data were additionally evaluated on a wet weight basis. Percent fines for sediment as well as percent solids for tissue used to calculate these values are provided in Table A-20. Tables A-21 through A-24 summarize the coefficients of determination (r<sup>2</sup>) for each sediment and tissue variation for PCBs and mercury on a numeric and log basis (including the dry weight and lipid and organic carbon (OC) normal [PCB only] analyses shown in Figures A-10 through A-25). For those pairings with an r<sup>2</sup> value greater than 0.3, the data were plotted (Figures A-26) through A-29). When the correlation was positive (i.e., tissue concentrations rose as sediment concentrations rose), a statistical evaluation was conducted to determine if the relationship was statistically significant with 90 percent confidence (i.e., p value < 0.1). The statistical output is included in Attachment A. The following sections describe the results of these analyses for each tissue type.

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<sup>&</sup>lt;sup>1</sup> Tissue concentrations were reported from the laboratory as wet weight and converted to dry weight using measured percent solids in each sample. If the percent solids was not available for a specific sample, an arithmetic mean of the percent solids in that tissue type was used for the calculation.

<sup>&</sup>lt;sup>2</sup> When TOC was ND, these samples were excluded from the mean calculations because of uncertainty with estimating TOC based on one-half the reporting limit.



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### 2.2.1 Aquatic Plants

Aquatic plants consisted primarily of the stems and leaves of alligator weed (*Alternanthera philoxeroides*). Three composite samples were collected from BSAs. The arithmetic mean of composites within each BSA was taken and associated with the arithmetic mean of the sediment concentrations for that BSA for the analysis.

The regression analyses for PCBs and mercury did not result in a predictive relationship between sediment and aquatic plant tissue on a dry weight or on an OC and lipid normalized (PCB only) basis (Figures A-10 and A-11). Similarly, the additional correlation analysis (Tables A-21 through A-24) did not indicate a predictive relationship between sediment on a percent fines normalized basis or plant tissue on a wet weight basis. Because a predictive relationship was not identified, it was necessary to calculate BAFs. The medians of the BSA-specific dw/dw BAFs of 0.42 milligrams per kilogram (mg/kg) for PCBs and 0.11 mg/kg for mercury were selected for use in estimating tissue concentrations in aquatic plants (Tables A-4 and A-5, respectively).

### 2.2.2 Emergent Insects

Emergent insects that were collected consisted primarily of crane flies (Tipulidae), damselflies (Odonata), and dragonflies (Odonata). Three composite samples were collected from each of the nine BSAs for a total of 27 samples from OU-4. Nine of the 27 composite samples contained crane flies as well as other species. Six of the composites, all of which were taken within EUA 02 and EUA 03, contained crane flies only and these samples had PCB concentrations that were substantially higher (5.8 to 7.8 mg/kg dw) than concentrations in the mixed samples, which ranged from 0.1 mg/kg dw to 0.8 mg/kg dw. Because the samples that contained mixtures of species, which included crane flies, did not contain higher PCB concentrations than samples containing only dragon or damsel flies, there appears to be substantial uncertainty associated with the exposure of crane flies. This uncertainty is discussed in Section 6.3.2 of the OU-1/OU-2 SERA. Because the crane fly only PCB data appear to be a separate population from the mixed species data, the approach for calculating emergent insect BAFs will be modified from the approach used for other tissue types as described below.

As was done for the other tissue types, the arithmetic mean of composites within each BSA was taken and associated with the arithmetic mean of the sediment sample concentrations for that BSA for the analysis for a total of nine discrete tissue and sediment concentration estimates. For PCBs, the regression analyses were conducted for mixed species samples only as the sample size for crane fly only samples (n=2) was too small to conduct a regression. The regression analyses for mixed species PCBs and all samples for mercury did not result in a predictive relationship between sediment and emergent insect tissue on a dry weight or on an OC and lipid normalized (PCB only) basis (Figures A-12 and A-13, respectively). Similarly, the additional correlation analysis (Tables A-21 through A-24) did not indicate a predictive relationship



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between sediment on a percent fines normalized basis or emergent insect tissue on a wet weight basis. Based on this analysis and the lack of a predictive relationship between sediment and tissue, it was necessary to calculate BAFs. Because of the different populations of data for PCBs, a median BAF is not recommended. Alternatively, a mean BAF for mixed samples was calculated separately from the mean BAF for crane flies only. The "mixed diet" BAF was calculated as a weighted average with 22 percent (i.e., the percent of samples collected that were comprised of only crane flies) of the BAF being represented by crane flies only and the remaining 78 percent represented by mixed species. This is considered a conservative proportion based on the survey data collected in 2006 and 2007 and reported in the Operable Unit 4 Ecological Survey Report (ARCADIS BBL 2007). These survey results showed that of the 60 survey sample locations crane flies were found in only four locations (7%) compared to odonates, which were found in 30 locations (50%). The resulting weighted mean BAF is 3.8 and is shown relative to the tissue data on Figure A-30. The selected BAF for mercury is the median value of the BSAs.

#### 2.2.3 Benthic Invertebrates

Benthic invertebrate samples that were collected from each of the nine BSAs consisted of Odonata larvae. Three composite benthic invertebrate samples were collected in each of the nine BSAs. The arithmetic mean of the three composites within each BSA was taken and associated with the arithmetic mean of the sediment sample concentrations for that BSA.

The regression analyses for PCBs and mercury did not result in a predictive relationship between sediment and benthic invertebrate tissue on a dry weight or on an OC and lipid normalized (PCB only) basis (Figures A-14 and A-15, respectively). The additional correlation analysis indicated a correlation between PCBs in sediment normalized to percent fines and benthic invertebrate tissue on a wet weight basis (Tables A-21 and A-22). The correlation to wet weight tissue was statistically significant (p=0.03). None of the other tissue types being consumed by receptors showed a positive correlation with fines normalized PCB concentrations in sediment. In addition, percent fines in sediment did not correlate well with PCB concentrations in sediment (Figure A-30). Thus, it was not possible to estimate a concentration for any other tissue type based on fines normalized sediment. Because no other element of any receptor diet is based on percent fines and because the risk calculations in the SERA require a fixed assumption about the percent of fines in sediment, it was not feasible to incorporate this fines normalized relationship into the overall dose estimation in the SERA. An evaluation of this uncertainty is provided in Section 6.3.2 of the SERA.

The additional correlation analysis for mercury resulted in an r<sup>2</sup> value greater than 0.3 for fines normalized, but the correlation in this case was negative (Figures A-28 and A-29). Based on these analyses, medians of the BSA-specific dw/dw BAFs of 0.92 mg/kg for PCBs and 0.39 mg/kg for mercury were selected for use in estimating tissue concentrations in benthic invertebrates (Tables A-8 and A-9, respectively).



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For the laboratory benthic invertebrate data, regression analyses demonstrated statistically significant predictive relationships between sediment PCB concentrations and *lumbriculus variegatus* tissue concentrations. Regressions are shown in Figures A-16 and A-17. The statistical evaluation of these regression analyses is provided in Attachment A. Both the regression equation from the laboratory study and field-based BAF are used to estimate benthic invertebrate tissue concentrations for the OU-1-OU-2 SERA dose calculations. Because sediment Aroclor vs. tissue homolog for both ww and lipid normalized worm tissue basis had good fit, the regression equation that best fit the field data was used, which was log tissue homolog ww versus log PCB Aroclor dw with an r<sup>2</sup> value of 0.89.

#### 2.2.4 Crayfish

Crayfish were collected from all nine BSAs. One to three composite samples were collected opportunistically in either emergent vegetation, run, or riffle habitats in each BSA. The arithmetic mean of the composites within each BSA was taken and associated with the arithmetic mean of the sediment sample concentrations for that BSA.

The regression analyses resulted in a predictive relationship between sediment and crayfish tissue for PCBs on a dry weight basis. However, as shown on Figure A-18, this correlation was negative. The OC and lipid normalized regressions for PCBs were not predictive, nor were the mercury regressions on a dry weight basis (Figures A-18 and A-19, respectively). The additional correlation analysis for PCBs resulted in r² values greater than 0.3 for two combinations (Tables A-21 and A-22), but the correlations were negative (Figures A-26 and A-27). For mercury, no predictive relationships were observed in the additional correlation analyses (Tables A-23 and A-24). Because a significant positive relationship was not identified, it was necessary to calculate BAFs. The medians of the BSA-specific dw/dw BAFs of 0.75 mg/kg for PCBs and 0.27 mg/kg for mercury were selected for use in estimating crayfish tissue concentrations (Tables A-12 and A-13, respectively).

### 2.2.5 Mollusks

Mollusks were collected from all nine BSAs. Efforts were made to collect mollusks in either emergent vegetation, run, or riffle habitats in each BSA. The arithmetic mean of the composites within each BSA was taken and associated with the arithmetic mean of the sediment sample concentrations for that BSA.

The regression analyses did not result in a predictive relationship between sediment and mollusk tissue for PCBs or mercury on a dry weight or on an OC and lipid normalized (PCB only) basis (Figure A-20 and A-21, respectively). Similarly, the additional correlation analysis for PCBs (Tables A-21 and A-22) did not indicate a predictive relationship between sediment on a percent fines normalized basis or tissue on a wet weight basis. The additional correlation analysis for mercury resulted in r² values greater than 0.3 for fines normalized sediment and wet weight tissue (Tables A-23 and A-24), but the correlations were negative



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(Figures A-28 and A-29). Because a significant positive relationship was not identified, it was necessary to calculate BAFs. The medians of the BSA-specific dw/dw BAFs of 6.5 mg/kg for PCBs and 0.47 mg/kg for mercury were selected for use in estimating mollusk tissue concentrations (Tables A-14 and A-15, respectively).

### 2.2.6 Snakes and Frogs

Snakes and frogs were collected in all nine BSAs. Efforts were made to collect tissues in each BSA. However, samples were not found in all areas. Tables A-2 and A-3 summarize the data available by BSA for snakes and frogs. Species of frogs collected include southern leopard frogs (*Thobates sphenocephalus*), bullfrogs (*Rana catesbeiana*), bronze or green frogs (*Rana clamitans*), and northern cricket frogs (*Acris crepitans*). Snake species collected include midland water snake (*Nerodia sipedon*), queen snake (*Regina septemvittata*), cottonmouth (*Agkistrodon piscivorus*), and yellow-bellied water snake (*Nerodia erythrogaster*). Because concentrations in frogs and snakes appear to be dissimilar, with snakes typically having higher body burdens than frogs, uptake was evaluated separately for frogs and snakes. The arithmetic mean of the frog or snake tissue samples within each BSA was taken and associated with the arithmetic mean of the sediment sample concentrations for that BSA.

The regression analyses did not result in a predictive relationship between sediment and frog tissue for PCBs or mercury on a dry weight or on an OC and lipid normalized (PCB only) basis (Figures A-22 and A-23, respectively), with the exception of the log PCB OC and lipid normalized regression. The statistical evaluation of this regression analysis is provided in Attachment A and showed that the correlation was not statistically significant. Similarly, the additional correlation analysis for PCBs (Tables A-21 and A-22) did not indicate a predictive relationship between sediment on a percent fines normalized basis or tissue on a wet weight basis. The additional correlation analysis for mercury resulted in r<sup>2</sup> values greater than 0.3 for fines normalized sediment and dry weight and wet weight tissue (Tables A-23 and A-24) and these results were statistically significant (Figures A-28 and A-29). The statistical evaluation of these regression analyses is provided in Attachment A. However, as discussed above for benthic invertebrates and PCBs, none of the other tissue types being consumed by receptors showed a positive correlation with fines normalized mercury concentrations in sediment. In addition, percent fines in sediment did not correlate well with mercury concentrations in sediment (Figure A-30). Thus, it was not possible to estimate a concentration for any other tissue type based on fines normalized sediment. Because no other element of any receptor diet is based on percent fines and because the risk calculations in the SERA require a fixed assumption about the percent of fines in sediment, it was not feasible to incorporate this fines normalized relationship into the overall dose estimation in the SERA.

Based on the results discussed above, the medians of the BSA-specific dw/dw BAFs of 3.4 mg/kg for PCBs and 0.75 mg/kg for mercury were selected for use in estimating frog tissue concentrations (Tables A-16 and A-17, respectively).



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For snakes, the regression analyses resulted in a predictive relationship between sediment and snake tissue for PCBs based on seven different sediment and tissue combinations (Tables A-21 and A-22) including on a dry weight basis (Figure A-24). However, the correlations were negative (Figure A-26 and A-27). For mercury (Figures A-28 and 29), no predictive relationship was identified. Because a significant positive relationship was not identified, it was necessary to calculate BAFs. The medians of the BSA-specific dw/dw BAFs of 26.91 mg/kg for PCBs and 1.11 mg/kg for mercury were selected for use in estimating snake tissue concentrations (Tables A-18 and A-19).

### 3. BAF Development for Remaining COPCs

This section describes the data and method for developing BAFs for barium, chromium, cobalt, lead, manganese, nickel, and vanadium for use in the SERA.

Metal COPCs were measured in sediment and tissue in approximately 10 percent of samples collected for PCB and mercury analysis, as described in Section 3.2 of the SERA. As there were too few samples to develop a regression model, it was necessary to estimate a BAF ratio for these metals.

The data were insufficient to test site data compared to the reference data to determine if these datasets represent different populations. Moreover, because the site-relatedness of the metal COPCs is not clear, it is more likely that site and reference data could be a part of one data population. As such, reference data were included in the BAF development for these metals. Table A-25 summarizes the metals data that were available and included in the BAF development. There were too few samples to develop a regression model or to develop a median of BSA averages, as was done for PCBs and mercury. Thus, BAFs for these seven metal COPCs were calculated using a ratio of mean tissue concentrations to mean sediment concentrations using the data from all BSAs and reference areas as shown in Equation 2.

Equation 2: BAF =  $X_{dwTissue}/X_{dw}s_{ediment}$ , (where X is the arithmetic mean)

This ratio of means was chosen as the most appropriate dw/dw BAF for the tissue and sediment data available for the OU-1/OU-2 portion of Snow Creek. A summary of non-mercury metal data and BAF calculations can be found in Table A-25.

### 4. Summary

As described above, when sufficient data were available, data were evaluated to determine if predictive relationships between sediment and tissue could be identified. Data were compiled by BSAs and initially evaluated on a dry weight basis for PCBs and mercury and lipid/organic carbon normalized basis for PCBs. Additional correlation analyses were conducted using fines normalized sediment as well as wet weight tissue. For the tissues evaluated herein, a predictive relationship was generally not found. Thus, the median



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BAF based on dry weight sediment and tissue was selected as the best method for estimating a tissue concentration for the foodweb in the SERA. Table A-26 summarizes the BAFs selected for the OU-1/OU-2 SERA.

### 5. References

ARCADIS. 2009. Phase II Field Sampling Plan for Operable Unit 4, Revision 2, Anniston, Alabama. April.

ARCADIS BBL. 2007. Operable Unit 4 Phase 1 Ecological Survey Report. December.

Ingersoll, CG, J.A. Steevens, DD MacDonald, WG Brumbaugh, MR Coady, J D Farrar, GR Lotufo, NE Kemble, JL Kunz, JK Stanley, JA Sinclair. In review. Evaluation of Toxicity to the Amphipod, Hyalella azteca, and to the Midge, *Chironomus dilutus*, and Bioaccumulation by the Oligochaete, *Lumbriculus variegatus*, with Exposure to PCB-contaminated Sediments from Anniston Alabama.



**Tables** 

### Table A-2 Sediment and Aquatic Biota Tissue PCB Summary

#### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

								PCB Resi	ults (mg/kg dry we	eight) <sup>1</sup> ; TOC (mg/kg)	; Lipids (%)							
EDR	BSA	Sediment Location	Sediment	Sediment TOC	Aquatic Plants	Aquatic Plant Lipids	Emergent Insects	Emergent Insects Lipids	Benthic Invertebrates	Invertebrates Lipids	Crayfish	Crayfish Lipids	Mollusks	Mollusks Lipids	Frog	Frog Lipids	Snake	Snake Lipids
		ELA-01-55	0.53	3855	0.63	0.50	0.67	2.6	1.6	0.80	1.3	0.60	10	0.50	na	na	45	1.7
		ELA-01-56	0.26	3020	0.37	0.70	0.96	2.7	0.90	0.90	0.83	0.50	11	0.50	na	na	35	2.2
		ELA-01-57	2.0	10600	0.58	0.40	1.2	3.2	0.91	1.0	1.1	0.20	6.1	0.60	na	na	35	4.4
	ELA-01	ELA-01-58	2.7	16200						Į.								•
		ELA-01-59	0.82	10100	i													
		ELA-01-60	2.4	22200	i													
		HHFL-04	1.3	3640	1													
		ELA-02-61	3.9	24800	0.25	0.90	0.74	4.2	0.80	0.90	0.24	0.20	12	0.40	5.4	1.0	26	1.3
<u>_</u>		ELA-02-62	2.4	23300	0.036	0.40	0.83	3.0	0.81	0.90	0.51	0.30	8.4	0.50	5.3	1.3	na	na
Lower		ELA-02-63	3.0	2350	0.042	0.80	1.4	3.0	1.0	0.80	1.3	0.40	14	0.60	na	na	na	na
೨	ELA-02	ELA-02-64	3.2	660						1								
		ELA-02-65	1.2	13100	1													
		ELA-02-66	1.1	4000														
		ELA-03-67	4.2	14300	0.33	0.70	0.71	2.9	0.74	0.80	0.68	0.60	11	0.60	na	na	30	2.5
		ELA-03-68	0.98	3110	0.24	0.70	0.95	1.9	0.94	0.70	0.76	0.60	11	0.60	na	na	48	4.9
		ELA-03-69	2.0	9750	0.042	0.70	1.2	2.9	0.61	0.90	0.87	0.50	12	0.60	na	na	55	2.2
	ELA-03	ELA-03-70	0.04	2090														
		ELA-03-71	0.10	620	1													
		ELA-03-72	0.4	1850	1													
		EMA-01-01	1.2	10000	0.041	1.1	0.31	3.1	1.6	1.7	2.6	0.80	4.9	0.60	2.4	0.70	122	1.3
		EMA-01-02	0.70	2270	1.1	0.50	0.55	3.7	1.3	2.1	2.6	0.90	4.6	0.80	4.6	3.2	na	na
		EMA-01-03	1.14	1800	0.39	1.0	0.69	3.9	1.2	1.3	na	na	6.3	0.80	na	na	na	na
	EMA-01	EMA-01-04	0.36	3940					**-									
		EMA-01-05	1.3	11400														
		EMA-01-06	2.3	13400	1													
		HHFL-05	0.2	2300	1													
		EMA-02-07	2.4	20100	1.7	0.50	0.68	3.6	2.0	1.9	2.1	0.80	7.3	0.50	3.4	0.70	19	2.0
		EMA-02-08	1.3	3740	1.2	0.40	0.73	3.3	1.9	1.0	na	na	6.4	0.70	2.9	0.70	na	na
Φ		EMA-02-09	5.2	12200	0.054	0.80	0.58	4.0	1.9	1.0	0.89	0.50	6.2	0.70	na	na	na	na
Middle		EMA-02-10	2.3	19300		1			***									
ž	EMA-02	EMA-02-11	2.0	13000														
		EMA-02-12	3.6	23500	1													
		C-064-SED-1	0.1	250	1													
		C-065-SED-3	0.2	250	1													
		EMA-03-31	0.23	3460	0.059	0.50	0.81	4.1	1.4	1.1	1.8	1.1	12	0.90	4.5	2.6	na	na
		EMA-03-32	0.021	30300	0.44	0.60	0.80	4.4	2.0	1.2	1.5	0.80	10	0.60	3.1	3.1	na	na
		EMA-03-33	0.38	7050	0.39	0.50	1.0	4.6	1.2	1.1	1.1	0.70	12	1.1	2.8	0.90	na	na
	EMA-03	EMA-03-34	0.69	4920	0.00	0.00							· ·-			. 0.00		
		EMA-03-35	3.9	37300	ĺ													
		EMA-03-36	1.5	31300	1													
	1	LIVIA-03-30	1.0	31300	l													

### Table A-2 Sediment and Aquatic Biota Tissue PCB Summary

#### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

								PCB Resi	ults (mg/kg dry we	eight) <sup>1</sup> ; TOC (mg/kg)	; Lipids (%)							
EDR	BSA	Sediment Location	Sediment	Sediment TOC	Aquatic Plants	Aquatic Plant	Emergent Insects	Emergent Insects Lipids	Benthic Invertebrates	Invertebrates Lipids	Crayfish	Crayfish Lipids	Mollusks	Mollusks Lipids	Frog	Frog Lipids	Snake	Snake Lipids
		EUA-01-19	1.1	4010	0.87	0.40	2.7	3.1	3.5	1.2	1.8	0.60	11	0.70	15	1.3	26	6.7
		EUA-01-20	3.1	4880	0.41	0.60	0.36	2.8	0.96	1.3	3.2	1.1	6.3	0.80	18	1.7	na	na
		EUA-01-21	0.81	3790	0.88	0.60	0.31	3.1	0.98	1.0	1.6	0.90	5.9	0.70	na	na	na	na
	EUA-01	EUA-01-22	2.0	3050		•		•			•	•				•		
		EUA-01-23	0.35	4370														
		EUA-01-24	2.8	6360														
		C-001-SED-4	1.9	250														
		EUA-02-43	1.9	5855	0.65	0.80	27	1.9	0.86	0.80	3.8	0.90	14	0.90	9.5	1.0	167	0.60
		EUA-02-44	0.40	2140	0.67	0.90	23	1.8	2.9	0.70	3.3	1.4	17	1.1	2.5	2.2	na	na
		EUA-02-45	1.5	2700	0.80	1.2	18	2.0	1.3	0.60	2.2	0.60	12	0.80	na	na	na	na
		EUA-02-46	0.26	7600							· ·			1				
		EUA-02-47	1.6	14000														
Upper	EUA-02	EUA-02-48	0.87	5380														
ďς		C-005-SED-1	0.23	250														
		C-008-SED-2	0.34	15000														
		C-008-SED-4	0.50	250														
		C-009-SED-1	2.13	250														
		C-010-SED-4	0.42	250														
		EUA-03-25	1.2	6950	0.76	0.60	25	2.6	1.1	0.90	1.3	0.50	17	0.90	17	1.0	na	na
		EUA-03-26	1.5	4560	1.2	0.60	23	2.2	2.3	1.6	na	na	15	0.60	38	0.80	na	na
		EUA-03-27	0.28	10700	1.2	0.60	20	2.4	1.3	1.4	na	na	8.8	0.70	5.6	0.90	na	na
	EUA-03	EUA-03-28	0.36	4160							•	•						
	EUA-03	EUA-03-29	2.4	4790														
		EUA-03-30	0.42	630														
		C-017-SED-2	8.90	23000														
		C-021-SED-4	1.22	13000														
		ERA-01-49	0.021	2450	0.042	0.90	0.16	3.0	0.15	0.80	na	na	0.28	0.80	na	na	1.3	2.0
		ERA-01-50	0.027	16200	0.040	1.0	0.16	2.8	0.12	0.80	na	na	0.27	0.80	na	na	1.2	1.8
		ERA-01-51	0.019	575	0.040	0.90	0.18	2.4	0.14	0.60	na	na	0.11	1.1	na	na	0.21	1.3
	ERA-01	ERA-01-52	0.020	610														
		ERA-01-53	0.024	2360														
		ERA-01-54	0.037	26000														
		ECO-REF-01	0.029	4310														
		ERA-02-13	0.017	7340	5.1	0.30	0.089	2.5	0.069	0.90	0.064	1.2	0.14	0.60	0.063	0.60	0.074	2.6
a)		ERA-02-14	0.036	26700	0.037	0.70	0.09	2.1	0.13	1.2	0.051	1.1	0.15	0.50	0.14	2.1	na	na
DG .		ERA-02-15	0.040	36200	0.051	0.40	0.07	2.3	0.15	0.70	0.063	1.0	0.11	0.40	na	na	na	na
<u> </u>	ERA-02	ERA-02-16	0.024	6830														
Reference		ERA-02-17	0.021	3580														
L		ERA-02-18	0.022	5180														
		ECO-REF-02	0.029	3430														
		ERA-03-37	0.055	128000	0.042	0.70	0.24	3.0	0.16	0.60	na	na	0.15	0.70	0.06	0.80	0.028	4.2
		ERA-03-38	0.030	34600	0.039	0.70	0.17	3.1	0.18	0.50	na	na	0.14	0.80	na	na	4.5	8.5
		ERA-03-39	0.036	26500	0.039	0.70	0.16	3.4	0.17	0.60	na	na	0.13	0.90	na	na	na	na
	ERA-03	ERA-03-40	0.020	2480														
		ERA-03-41	0.021	5320														
		ERA-03-42	0.047	48300														
		ECO-REF-03	0.025	1560														

#### General Note:

Red text indicates value is shown at half the reporting limit

Total PCB calculated as non-detect = 0 if one or more Aroclor or homolog detected; if all are non-detect then one-half the highest reporting limit for individual Aroclor or homolog shown in red.

#### Footnote:

1 Sediment, crayfish tissue, and mollusk tissue concentrations were measured as Aroclors while all other tissue concentrations were measured as homologs

#### Acronyms and Abbreviations:

BSA = biological sampling area EDR = ecologically distinct reach mg/kg = milligrams per kilogram na = no sample aquired in specified area OU = Operable Unit PCB = polychlorinated biphenyl

#### Table A-3 Sediment and Aquatic Biota Tissue Mercury Summary

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

				Mercury Results (mg/kg dry weight); TOC (mg/kg); lipid (%)  Benthic														
		Sediment			Aquatic	Aquatic	Emergent	Emergent	Benthic	Invertebrates		Crayfish		Mollusks		Frog		Snake
EDR	BSA	Location	Sediment	Sediment TOC	Plants	Plants Lipids	Insects	Insects Lipids	Invertebrates	Lipids	Crayfish	Lipids	Mollusks	Lipids	Frog	Lipids	Snake	Lipids
EDK	DOA	ELA-01-55	0.35	2250	0.023	0.50	0.16	2.6	0.36	0.80	0.36	0.60	0.56	0.50	na	na	0.78	1.7
		ELA-01-56	0.19	3020	0.052	0.70	0.10	2.7	0.36	0.90	0.26	0.50	0.80	0.50	na	na	1.1	2.2
		ELA-01-57	0.62	10600	0.024	0.40	0.25	3.2	0.32	1.0	0.19	0.20	0.52	0.60	na	na	0.94	4.4
	ELA-01	ELA-01-58	0.69	16200														
	-	ELA-01-59	6.3	10100														
		ELA-01-60	0.58	22200	•													
		HHFL-04	0.38	3640	•													
		ELA-02-61	0.91	24800	0.092	0.90	0.14	4.2	0.27	0.90	0.29	0.20	0.78	0.40	0.56	1.0	1.9	1.3
ū		ELA-02-62	0.75	23300	0.069	0.40	0.19	3.0	0.58	0.90	0.20	0.30	0.85	0.50	0.32	1.3	na	na
Lower	ELA-02	ELA-02-63	0.49	2350	0.033	0.80	0.24	3.0	0.25	0.80	0.21	0.40	1.0	0.60	na	na	na	na
ت		ELA-02-64	0.27	660														
		ELA-02-65	0.52	13100														
		ELA-02-66	0.59	4000														
		ELA-03-67	1.6	14300	0.073	0.70	0.08	2.9	0.26	0.80	0.11	0.60	0.73	0.60	na	na	2.1	2.5
		ELA-03-68	0.37	3110	0.067	0.70	0.11	1.9	0.70	0.70	0.14	0.60	0.88	0.60	na	na	1.4	4.9
	ELA-03	ELA-03-69	0.43	9750	0.060	0.70	0.17	2.9	0.34	0.90	0.14	0.50	0.78	0.60	na	na	0.42	2.2
		ELA-03-70	0.16	2090														
		ELA-03-71	0.22	620														
		ELA-03-72	0.19	1850														
		EMA-01-01	0.43	10000	0.063	1.1	0.15	3.1	0.22	1.7	0.19	0.80	0.17	0.60	0.67	0.70	0.54	1.3
		EMA-01-02	0.61	2270	0.024	0.50	0.19	3.7	0.24	2.1	0.17	0.90	0.37	0.80	0.33	3.2	na	na
		EMA-01-03	0.73	2345	0.081	1.0	0.32	3.9	0.32	1.3	na	na	0.14	0.80	na	na	na	na
		EMA-01-04	0.74	3940														
		EMA-01-05	0.50	11400														
		EMA-01-06	0.91	13400														
		HHFL-05	0.74	2300				•				1		1				
		EMA-02-07	0.65	20100	0.069	0.50	0.077	3.6	0.44	1.9	0.21	0.80	0.27	0.50	0.33	0.70	1.7	2.0
Middle		EMA-02-08	0.84	3740	0.081	0.40	0.034	3.3	0.26	1.0	na	na	0.28	0.70	0.24	0.70	na	na
Jid	EMA-02	EMA-02-09	1.1	12200	0.38	0.80	0.038	4.0	0.23	1.0	0.14	0.50	0.33	0.70	na	na	na	na
_		EMA-02-10	0.69	19300														
		EMA-02-11	0.47	13000														
		EMA-02-12	0.87	23500	0.004	0.50	0.45		0.00		0.40		0.40	0.00	0.00			
		EMA-03-31 EMA-03-32	0.30	3460	0.024	0.50 0.60	0.15 0.13	4.1	0.30	1.1	0.12 0.14	1.1	0.42	0.90 0.60	0.28	2.6	na	na
			0.43 0.45	30300 7050	0.023 0.025	0.60	0.13	4.4 4.6	0.41 0.28	1.2 1.1	0.14	0.80 0.70	0.37 0.36	1.1	0.37	3.1 0.90	na	na
	EMA-03	EMA-03-33 EMA-03-34	0.45	7050 4920	0.025	0.50	0.12	4.0	υ.28	1.1	0.∠0	0.70	0.30	1.1	1.8	0.90	na	na
		EMA-03-35	0.81	37300														
		EMA-03-36	0.61	31300														
L	1	EIVIA-US-SO	0.75	31300														

#### Table A-3 Sediment and Aquatic Biota Tissue Mercury Summary

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

								Mercury F	tesults (mg/kg dry	weight); TOC (mg/k	g); lipid (%)							
		Sediment			Aquatic	Aquatic	Emergent	Emergent	Benthic	Benthic Invertebrates		Crayfish		Mollusks		Frog		Snake
EDR	BSA	Location	Sediment	Sediment TOC	Plants	Plants Lipids	Insects	Insects Lipids	Invertebrates	Lipids	Crayfish	Lipids	Mollusks	Lipids	Frog	Lipids	Snake	Lipids
LDIC	DOA	EUA-01-19	2.6	4010	0.024	0.40	0.13	3.1	0.13	1.2	0.12	0.60	0.14	0.70	0.63	1.3	0.88	6.7
		EUA-01-20	0.83	4880	0.020	0.60	0.10	2.8	0.19	1.3	0.13	1.1	0.14	0.80	1.0	1.7	na	na
		EUA-01-21	2.90	3790	0.046	0.60	0.11	3.1	0.16	1.0	0.12	0.90	0.16	0.70	na	na	na	na
	EUA-01	EUA-01-22	0.30	3050							•		•					
		EUA-01-23	0.78	4370														
		EUA-01-24	0.75	6360														
		EUA-02-43	0.47	5855	0.075	0.80	0.27	1.9	0.13	0.80	0.40	0.90	0.26	0.90	0.12	1.0	0.61	0.60
		EUA-02-44	0.039	2140	0.085	0.90	0.23	1.8	0.31	0.70	0.12	1.4	0.30	1.1	0.13	2.2	na	na
ē		EUA-02-45	0.32	2700	0.065	1.2	0.30	2.0	0.19	0.60	0.14	0.60	0.25	0.80	na	na	na	na
Upper	EUA-02	EUA-02-46	0.054	7600														
		EUA-02-47	1.0	14000	i.													
		C-005-SED-2	0.65	250	i.													
		EUA-02-48	1.3	5380														
		EUA-03-25	1.3	6950	0.088	0.60	0.42	2.6	0.18	0.90	0.19	0.50	0.32	0.90	0.73	1.0	na	na
		EUA-03-26	0.91	4560	0.080	0.60	0.36	2.2	0.28	1.6	na	na	0.38	0.60	1.0	0.80	na	na
	EUA-03	EUA-03-27	0.27	10700	0.11	0.60	0.32	2.4	0.15	1.4	na	na	0.22	0.70	0.86	0.90	na	na
		EUA-03-28	0.35	4160														
		EUA-03-29	0.86	4790														
		EUA-03-30	1.0 0.007	630	0.064	0.00	0.066	2.0	0.004	0.00			0.00	0.00			101	- 0.0
		ERA-01-49 ERA-01-50	0.007	2450 16200		0.90 1.0	0.066	3.0 2.8	0.091 0.072	0.80 0.80	na	na	0.23 0.20	0.80	na	na	1.0 0.52	2.0 1.8
		ERA-01-50	0.024	575	0.017 0.046	0.90	0.047	2.4	0.072	0.60	na	na na	0.20	1.1	na na	na na	0.52	1.3
	EDA 01	ERA-01-52	0.007	610	0.040	0.90	0.035	2.4	0.090	0.00	na	Ha	0.24	1.1	Ha	Ha	0.41	1.3
	LIVA-01	ERA-01-53	0.008	2360														
		ERA-01-54	0.000	26000	•													
		ECO-REF-01	0.014	4310														
		ERA-02-13	0.006	7340	0.019	0.30	0.068	2.5	0.10	0.90	0.06	1.2	0.70	0.60	0.11	0.60	0.50	2.6
		ERA-02-14	0.013	26700	0.035	0.70	0.041	2.1	0.16	1.2	0.10	1.1	0.57	0.50	0.11	2.1	na	na
<u>8</u>		ERA-02-15	0.034	36200	0.021	0.40	0.048	2.3	0.20	0.70	0.09	1.0	0.68	0.40	na	na	na	na
Reference	ERA-02		0.008	6830												1		
e e		ERA-02-17	0.008	3580														
œ		ERA-02-18	0.008	5180														
		ECO-REF-02	0.022	3430														
		ERA-03-37	0.11	128000	0.018	0.70	0.17	3.0	0.075	0.60	na	na	0.29	0.70	0.11	0.80	0.32	4.2
		ERA-03-38	0.032	34600	0.016	0.70	0.17	3.1	0.064	0.50	na	na	0.20	0.80	na	na	0.57	8.5
		ERA-03-39	0.041	26500	0.017	0.70	0.25	3.4	0.070	0.60	na	na	0.17	0.90	na	na	na	na
	ERA-03	ERA-03-40	0.007	2480							•		•					
		ERA-03-41	0.007	5320														
		ERA-03-42	0.041	48300	•													
		ECO-REF-03	0.016	1560														

#### General Note:

Red text indicates value is shown at half the reporting limit

### Acronyms and Abbreviations:

Acronyms and Abbreviations:
BSA = biological sampling area
EDR = ecologically distinct reach
mg/kg = milligrams per kilogram
na = no sample aquired in specified area
OU = Operable Unit
PCB = polychlorinated biphenyl

## Table A-4 PCB - Aquatic Plant Tissue Uptake Summary

# Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sedi	ment	Tis	sue	BAF	BSAF
BSA Location ID	mg PCB/kg sediment dw	mg PCB/kg toc dw	mg PCB/kg tissue-dw	mg PCB/kg lipid ww	dw sed/dw tissue	toc dw/lipid ww
ELA-01	1.42	168.18	0.53	17.33	0.37	0.10
ELA-02	2.45	379.43	0.11	3.41	0.05	0.01
ELA-03	1.29	206.52	0.21	5.88	0.16	0.03
EMA-01	1.03	221.93	0.50	13.39	0.48	0.06
EMA-02	2.12	218.80	0.99	28.30	0.47	0.13
EMA-03	1.12	69.21	0.30	8.11	0.27	0.12
EUA-01	1.72	380.99	0.72	22.92	0.42	0.06
EUA-02	0.93	265.58	0.70	17.13	0.76	0.06
EUA-03	2.03	225.60	1.04	32.78	0.52	0.15
BSA Average	1.57	237.36	0.57	16.58	0.36	0.07
BSA Median					0.42	0.06

### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized sediment)

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-5 Mercury - Aquatic Plant Tissue Uptake Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sediment	Tissue	BAF
BSA Location ID	mg Hg/kg sediment dw	mg Hg/kg tissue- dw	dw sed/dw tissue
ELA-01	1.33	0.033	0.02
ELA-02	0.59	0.065	0.11
ELA-03	0.50	0.066	0.13
EMA-01	0.67	0.056	0.08
EMA-02	0.77	0.18	0.23
EUA-01	1.36	0.030	0.022
EUA-02	0.55	0.075	0.14
EUA-03	0.78	0.094	0.12
BSA Average	0.82	0.074	0.09
BSA Median			0.11

### Notes:

BSA = biological sampling area

dw = dry weight

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-6 PCB - Emergent Insect Tissue Uptake Summary

## Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

		Sedi	ment	Tis	sue	BAF	BSAF
BSA	Sample ID	mg PCB/kg sediment dw	mg PCB/kg toc dw	mg PCB/kg tissue-dw	mg PCB/kg lipid ww	dw sed/dw tissue	toc dw/lipid ww
ELA-01	C85020	1.42	168.18	1.17	10.81	0.83	0.06
	C85015	1.42	168.18	0.67	7.81	0.47	0.05
	C85016	1.42	168.18	0.96	11.22	0.68	0.07
ELA-02	C85001	2.45	379.43	0.74	6.57	0.30	0.02
	C85023	2.45	379.43	1.38	14.23	0.56	0.04
	C85017	2.45	379.43	0.83	9.50	0.34	0.03
ELA-03	C85027	1.29	206.52	1.19	11.97	0.92	0.06
	C85019	1.29	206.52	0.95	9.42	0.74	0.05
	C85018	1.29	206.52	0.71	6.93	0.55	0.03
EMA-01	C85024	1.03	221.93	0.31	3.10	0.30	0.01
	C85026	1.03	221.93	0.69	5.56	0.67	0.03
	C85025	1.03	221.93	0.55	4.97	0.53	0.02
EMA-02	C85011	2.12	218.80	0.68	5.64	0.32	0.03
	C85012	2.12	218.80	0.73	7.21	0.34	0.03
	C85013	2.12	218.80	0.58	5.68	0.27	0.03
EMA-03	C85002	1.12	69.21	0.81	6.24	0.72	0.09
	C85003	1.12	69.21	0.80	6.27	0.71	0.09
	C85004	1.12	69.21	1.01	7.85	0.90	0.11
EUA-01	C85021	1.72	380.99	0.36	3.86	0.21	0.01
	C85022	1.72	380.99	0.31	3.13	0.18	0.01
	C85014	1.72	380.99	2.68	26.68	1.56	0.07
BSA Average (ELA-01 thru EUA-01)		1.59	235.01	0.86	8.32	0.54	0.04
EUA-02	C85005	0.93	266	27	387	29	1.46
	C85006	0.93	266	23	382	25	1.44
	C85007	0.93	266	18	288	19	1.08
EUA-03	C85008	2.03	226	25	300	12	1.33
	C85009	2.03	226	23	351	11	1.56
	C85010	2.03	226	20	264	10	1.17
BSA Average (EUA-02 and EUA-03)	i	1.48	245.59	22.89	328.76	15.48	1.34
BSA Weighted Average <sup>2</sup>						3.8	

#### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized sediment)

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

<sup>&</sup>lt;sup>1</sup> The data consisted of two populations, mixed emergent insect species and cranefly only, so data for samples with cranefly only (EUA-02 and EUA-03) were separated out. The BAF for each population was calculated as a ratio of the mean tissue (dw) to the mean sediment (dw).

 $<sup>^2</sup>$  Based on the two populations, a "mixed diet" BAF was calculated as a weighted average with 22% of the BAF represented by cranefly only data and the remaining 78% represented by mixed species data.

### Table A-7 Mercury - Emergent Insect Tissue Uptake Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sediment	Tissue	BAF
BSA	mg Hg/kg sediment dw	mg Hg/kg tissue-dw	dw sed/dw tissue
ELA-01	1.33	0.21	0.15
ELA-02	0.59	0.19	0.32
ELA-03	0.50	0.12	0.24
EMA-01	0.67	0.22	0.33
EMA-02	0.77	0.05	0.06
EMA-03	0.54	0.13	0.25
EUA-01	1.36	0.11	0.08
EUA-02	0.55	0.27	0.49
EUA-03	0.78	0.37	0.47
BSA Average	0.79	0.18	0.24
BSA Median			0.25

### Notes:

BSA = biological sampling area

dw = dry weight

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

## Table A-8 PCB - Benthic Invertebrate Tissue Uptake Summary

# Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sedi	ment	Tis	sue	BAF	BSAF
BSA	mg PCB/kg sediment dw	mg PCB/kg toc dw	mg PCB/kg tissue-dw	mg PCB/kg lipid ww	dw sed/dw tissue	toc dw/lipid ww
ELA-01	1.42	168.18	1.13	20.19	0.80	0.12
ELA-02	2.45	379.43	0.87	18.61	0.36	0.05
ELA-03	1.29	206.52	0.76	16.59	0.59	0.08
EMA-01	1.03	221.93	1.36	17.74	1.32	0.08
EMA-02	2.12	218.80	1.95	31.85	0.92	0.15
EMA-03	1.12	69.21	1.54	22.97	1.37	0.33
EUA-01	1.72	380.99	1.82	28.81	1.06	0.08
EUA-02	0.93	265.58	1.68	33.78	1.81	0.13
EUA-03	2.03	225.60	1.59	24.45	0.78	0.11
BSA Average	1.57	237.36	1.41	23.89	0.90	0.10
BSA Median					0.92	0.11

#### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized sediment)

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-9 Mercury - Benthic Invertebrate Tissue Uptake Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sediment	Tissue	BAF
BSA	mg Hg/kg sediment dw	mg Hg/kg tissue-dw	dw sed/dw tissue
ELA-01	1.33	0.34	0.26
ELA-02	0.59	0.37	0.62
ELA-03	0.50	0.43	0.88
EMA-01	0.67	0.26	0.39
EMA-02	0.77	0.31	0.40
EMA-03	0.54	0.33	0.61
EUA-01	1.36	0.16	0.12
EUA-02	0.55	0.21	0.38
EUA-03	0.78	0.20	0.26
BSA Average	0.79	0.29	0.37
BSA Median			0.39

### Notes:

BSA = biological sampling area

dw = dry weight

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-10

### PCB - *Lumbriculous* Tissue Uptake Summary (sediment and tissue measured as homolog groups)

## Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sedi	ment	Tis	sue	BAF	BSAF
Sample Name	mg Homolog PCB/kg sediment dw	mg Homolog PCB/kg TOC dw	mg Homolog PCB/kg tissue ww	mg Homolog PCB/kg lipid tissue ww	dw sediment/w w tissue	toc dw/lipid ww
1	68.0	3617	106	6190	1.6	1.7
2	120	3922	60.0	3681	0.5	0.94
11	170	4521	137	10748	0.8	2.4
13	31.0	2818	47.2	3152	1.5	1.1
14	68.0	3560	118	8129	1.7	2.3
16	0.0912	34	1.92	128	21	3.7
20	8.80	793	23.4	1399	2.7	1.8
23	15.0	721	21.3	1214	1.4	1.7
24	0.310	140.9	8.01	607	26	4.3
25	60.0	2317	101	3500	1.7	1.5
27	14.0	915	65.9	3615	4.7	4.0
28	0.410	74	2.3	178	5.6	2.4
Average	46.3	1953	57.8	3545	1.2	1.8
Median					1.7	1.8

### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-11

### PCB - Lumbriculous Tissue Uptake Summary (sediment measures as Aroclors and tissue as homolog groups)

## Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sedi	ment	Tis	sue	BAF	BSAF
Sample Name	mg Aroclor PCB/kg sediment dw	mg Aroclor PCB/kg TOC dw	mg Homolog PCB/kg tissue ww	mg Homolog PCB/kg lipid tissue ww	dw sediment/ww tissue	toc dw/lipid ww
1	27.0	1436	106	6190	3.9	4.3
2	37.1	1212	60.0	3681	1.6	3.0
11	71.0	1888	137	10748	1.9	5.7
13	14.1	1282	47.2	3152	3.4	2.5
14	28.3	1482	118	8129	4.2	5.5
16	0.0480	18.1	1.92	128	40	7.1
20	3.08	277	23.4	1399	7.6	5.0
23	4.90	236	21.3	1214	4.4	5.2
24	0.270	123	8.01	607	30	4.9
25	26.3	1015	101	3500	3.9	3.4
27	7.23	473	65.9	3615	9.1	7.6
28	0.535	97.0	2.28	178	4.3	1.8
Average	18.3	795	57.8	3545	3.2	4.5
Median					4.2	4.9

### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

## Table A-12 PCB - Crayfish Tissue Uptake Summary

# Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sedi	ment	Tis	sue	BAF	BSAF
BSA	mg PCB/kg sediment dw	mg PCB/kg toc dw	mg PCB/kg tissue-dw	mg PCB/kg lipid ww	dw sed/dw tissue	toc dw/lipid ww
ELA-01	1.42	168.18	1.06	85.88	0.75	0.51
ELA-02	2.45	379.43	0.67	54.75	0.27	0.14
ELA-03	1.29	206.52	0.77	40.78	0.60	0.20
EMA-01	1.03	221.93	2.61	82.64	2.53	0.37
EMA-02	2.12	218.80	1.48	53.03	0.69	0.24
EMA-03	1.12	69.21	1.50	63.51	1.34	0.92
EUA-01	1.72	380.99	2.21	66.06	1.29	0.17
EUA-02	0.93	265.58	3.11	85.76	3.34	0.32
EUA-03	2.03	225.60	1.29	70.60	0.64	0.31
BSA Average	1.57	237.36	1.63	67.00	1.04	0.28
BSA Median					0.75	0.31

### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized sediment)

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-13 Mercury - Crayfish Tissue Uptake Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sediment	Tissue	BAF
BSA	mg Hg/kg sediment dw	mg Hg/kg tissue-dw	dw sed/dw tissue
ELA-01	1.33	0.27	0.20
ELA-02	0.59	0.24	0.40
ELA-03	0.50	0.13	0.27
EMA-01	0.67	0.18	0.27
EMA-02	0.77	0.17	0.22
EMA-03	0.54	0.15	0.28
EUA-01	1.36	0.12	0.09
EUA-02	0.55	0.22	0.40
EUA-03	0.78	0.19	0.24
BSA Average	0.79	0.19	0.24
BSA Median	_		0.27

### Notes:

BSA = biological sampling area

dw = dry weight

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

## Table A-14 PCB - Mollusk Tissue Uptake Summary

# Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sedi	ment	Tis	sue	BAF	BSAF
BSA	mg PCB/kg sediment dw	mg PCB/kg toc dw	mg PCB/kg tissue-dw	mg PCB/kg lipid ww	dw sed/dw tissue	toc dw/lipid ww
ELA-01	1.42	168.18	9.21	105.40	6.50	0.63
ELA-02	2.45	379.43	11.27	178.04	4.59	0.47
ELA-03	1.29	206.52	11.26	142.78	8.75	0.69
EMA-01	1.03	221.93	5.24	66.14	5.09	0.30
EMA-02	2.12	218.80	6.66	91.91	3.13	0.42
EMA-03	1.12	69.21	11.30	123.72	10.07	1.79
EUA-01	1.72	380.99	7.61	85.21	4.44	0.22
EUA-02	0.93	265.58	14.07	126.47	15.13	0.48
EUA-03	2.03	225.60	13.46	163.94	6.64	0.73
BSA Average	1.57	237.36	10.01	120.40	6.39	0.51
BSA Median					6.50	0.48

### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized sediment)

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-15 Mercury - Mollusk Tissue Uptake Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sediment	Tissue	BAF
BSA	mg Hg/kg sediment dw	mg Hg/kg tissue-dw	dw sed/dw tissue
ELA-01	1.33	0.63	0.47
ELA-02	0.59	0.88	1.50
ELA-03	0.50	0.80	1.61
EMA-01	0.67	0.23	0.34
EMA-02	0.77	0.29	0.38
EMA-03	0.54	0.38	0.71
EUA-01	1.36	0.15	0.11
EUA-02	0.55	0.27	0.49
EUA-03	0.78	0.30	0.39
BSA Average	0.79	0.44	0.56
BSA Median			0.47

### Notes:

BSA = biological sampling area

dw = dry weight

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

## Table A-16 PCB - Frog Tissue Uptake Summary

# Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sedir	ment	Tis	sue	BAF	BSAF
BSA	mg PCB/kg sediment dw	mg PCB/kg toc dw	mg PCB/kg tissue-dw	mg PCB/kg lipid ww	dw sed/dw tissue	toc dw/lipid ww
ELA-02	2.45	379.43	5.36	102.23	2.18	0.27
EMA-01	1.03	221.93	3.50	59.18	3.40	0.27
EMA-02	2.12	218.80	3.18	88.07	1.50	0.40
EMA-03	1.12	69.21	3.46	41.66	3.08	0.60
EUA-01	1.72	380.99	16.48	250.23	9.61	0.66
EUA-02	0.93	265.58	6.04	106.39	6.49	0.40
EUA-03	2.03	225.60	20.33	489.06	10.03	2.17
BSA Average	1.63	251.65	8.33	162.40	5.12	0.65
BSA Median					3.40	0.40

### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized sediment)

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-17 Mercury - Frog Tissue Uptake Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sediment	Tissue	BAF
BSA	mg Hg/kg sediment dw	mg Hg/kg tissue- dw	dw sed/dw tissue
ELA-02	0.59	0.44	0.75
EMA-01	0.67	0.50	0.75
EMA-02	0.77	0.28	0.37
EMA-03	0.54	0.80	1.48
EUA-01	1.36	0.82	0.61
EUA-02	0.55	0.13	0.23
EUA-03	0.78	0.87	1.12
BSA Average	0.75	0.55	0.73
BSA Median			0.75

### Notes:

BSA = biological sampling area

dw = dry weight

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

## Table A-18 PCB - Snake Tissue Uptake Summary

# Streamlined Ecological Risk Assessment for OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sedi	ment	Tis	sue	BAF	BSAF
BSA	mg PCB/kg sediment dw	mg PCB/kg toc dw	mg PCB/kg tissue-dw	mg PCB/kg lipid ww	dw sed/dw tissue	toc dw/lipid ww
ELA-01	1.42	168.18	38.09	406.19	26.91	2.42
ELA-02	2.45	379.43	26.08	531.54	10.63	1.40
ELA-03	1.29	206.52	44.59	397.29	34.65	1.92
EMA-01	1.03	221.93	122.30	2438.46	118.65	10.99
EMA-02	2.12	218.80	18.94	250.00	8.91	1.14
EUA-01	1.72	380.99	25.89	114.78	15.10	0.30
EUA-02	0.93	265.58	166.52	6383.33	179.11	24.04
BSA Average	1.57	263.06	63.20	1503.08	40.38	5.71
BSA Median					26.91	1.92

#### Notes:

BSA = biological sampling area

dw = dry weight

toc = total organic carbon

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

BSAF = biota/sediment accumulation factor (ww lipid normalized tissue vs dw organic carbon normalized sediment)

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

## Table A-19 Mercury - Snake Tissue Uptake Summary

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A – Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

	Sediment	Tissue	BAF
BSA	mg Hg/kg sediment dw	mg Hg/kg tissue-dw	dw sed/dw tissue
ELA-01	1.33	0.95	0.72
ELA-02	0.59	1.89	3.21
ELA-03	0.50	1.32	2.66
EMA-01	0.67	0.54	0.81
EMA-02	0.77	1.70	2.21
EUA-01	1.36	0.88	0.64
EUA-02	0.55	0.61	1.11
BSA Average	0.82	1.13	1.37
BSA Median			1.11

### Notes:

BSA = biological sampling area

dw = dry weight

BAF = bioaccumulation factor (dry weight tissue vs dry weight sediment)

carbon normalized sediment)

ww = wet weight

kg = kilogram(s)

mg = milligram(s)

OU = Operable Unit

### Table A-20 Sediment and Aquatic Biota Tissue Percent Solids Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

BSA   Sediment   Sediment   Sediment   Protect   Prote									%	Solids			
ELAO1-55   0.35   2250   51   15.6   30.3   14.3   27.6   5.9   ne   23.2	EDB	Dev		Sadiment				_		Crowlish	Malluaka	From	Snaka
ELA-01 56 0.19 3020 144 18.0 31.4 15.7 27.7 5.1 na 25.5 ELA-01 ELA-01 60.02 10600 48 15.7 29.6 18.4 28.5 7.9 na 25.5 ELA-01 61.0-158 0.69 16200 56 ELA-01-58 0.83 1090 1500 56 ELA-01-58 0.83 10100 53 ELA-01-60 0.58 2200 71 HIHFL-04 0.38 3640 21 ELA-02-61 0.91 24800 40 24.9 37.2 17.2 27.2 8.2 23.2 26.5 ELA-02-62 0.075 23500 49 23.3 34.2 18.0 27.9 8.1 18.3 na ELA-02-62 0.02 13.0 19 24800 40 24.9 37.2 17.2 27.9 8.1 18.3 na ELA-02-62 0.02 13.0 19 24800 40 24.9 37.2 17.2 27.9 8.1 18.3 na ELA-02-63 0.02 13.0 19 25.0 18.5 24.3 0.9 na na na ELA-02-63 0.02 13.0 19 25.0 18.5 24.3 0.9 na na na ELA-02-63 0.02 13.0 19 25.0 18.5 24.3 0.9 na na na ELA-02-63 0.02 13.0 19 25.0 18.8 15.5 27.9 0.9 na 27.7 ELA-02-68 0.99 4000 70 ELA-02-68 0.99 4000 70 ELA-02-68 0.99 14.0 18.8 15.8 27.9 0.9 na 27.7 ELA-03-68 0.37 3110 95 21.0 18.8 15.8 27.9 0.9 na 27.7 ELA-03-68 0.37 3110 95 21.0 18.8 15.8 27.9 0.9 na 27.7 ELA-03-68 0.37 20.1 18.9 11.1 17.7 na 25.9 ELA-03-68 0.37 22 6.0 14 ELA-03-70 0.16 2090 11 ELA-03-68 0.37 22 6.0 14 ELA-03-70 0.16 2090 11 ELA-03-70 0.16 2090 11 ELA-03-70 0.16 2090 11 ELA-03-70 0.16 2090 11 ELA-03-70 0.16 2090 11 ELA-03-70 0.16 2090 11 ELA-03-70 0.16 ELA-03-70 0.16 2090 11 ELA-03-70 0.16 ELA-03-70 0.16 2090 11 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.16 ELA-03-70 0.10 ELA-03-70 0.16 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-70 0.10 ELA-03-7	EDK	DOA											
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### ELA-91-60   0.56   22200   71   ### ELA-91-60   0.36   3840   21   ### ELA-92-61   0.91   24800   40   24.9   37.2   17.2   27.2   8.2   23.2   25.5   ### ELA-92-62   0.75   23300   48   23.3   34.2   19.0   27.9   8.1   19.3   na   ### ELA-92-63   0.49   23500   41   20.3   30.9   18.5   24.3   6.9   na   na   ### ELA-92-65   0.52   13100   27   ### ELA-92-65   0.52   13100   27   ### ELA-92-65   0.52   13100   27   ### ELA-93-67   1.6   14300   52   19.3   28.3   17.0   29.3   8.2   na   22.2   ### ELA-93-68   0.43   9750   76   20.1   18.8   15.8   27.9   6.9   na   27.7   ### ELA-93-78   0.22   0.60   11   ### ELA-93-79   0.22   0.60   11   ### ELA-93-79   0.22   0.60   17   ### ELA-93-79   0.23   0.60   0.91   ### ELA-93-79   0.23   0.60   0.91   ### ELA-93-79   0.73   2345   18   22.1   31.4   19.0   na   8.8   na   na   ### ELA-93-79   0.65   20100   33   12.6   29.7   22.5   23.8   7.9   18.9   26.4   ### ELA-92-11   0.47   13000   71   ### ELA-92-11   0.47   13000   71   ### ELA-92-11   0.47   13000   55   ### ELA-92-11   0.47   13000   22   15.7   38.0   20.2   25.1   9.5   na   na   ### ELA-92-11   0.47   13000   55   ### ELA-92-13   0.48   0.49   0.49   0.4		LLX					1						
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ELA-02  ELA-02  ELA-02  ELA-02-63  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-02-65  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-67  ELA-03-69  ELA-03-68  ELA-03-71	<u></u>												
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ELA-02-66 0.59 4000 70  ELA-03-67 1.6 143000 52 19.3 28.3 17.0 29.3 8.2 na 22.2  ELA-03-68 0.37 3110 95 21.0 18.8 15.8 27.9 6.9 na 27.7  ELA-03-68 0.37 3110 95 21.0 18.8 15.8 27.9 6.9 na 27.7  ELA-03-70 0.16 2090 11  ELA-03-70 0.16 2090 11  ELA-03-72 0.19 1850 73  EMA-01-01 0.43 10000 36 20.8 31.0 23.6 26.7 9.8 23.8 25.9  EMA-01 0.0 0.61 2270 17 14.5 33.4 22.2 27.0 8.7 25.1 na EMA-01-02 0.61 2270 17 14.5 33.4 22.2 27.0 8.7 25.1 na EMA-01-05 0.50 11400 46  EMA-01 0.0 0.91 13400 71  HHFI-05 0.74 2300 19  EMA-02-08 0.94 3740 18 13.5 32.6 17.1 na 8.2 20.0 na na EMA-02-08 0.94 17.0 22 15.7 39.0 20.2 25.1 9.5 na na EMA-02-08 0.94 17.0 20.0 19  EMA-02-10 0.69 19300 49  EMA-02-11 0.47 25000 55  EMA-03-31 0.30 3460 16 14.5 31.8 19.3 36.1 8.5 24.6 na EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na EMA-03-35 0.81 37300 21  EMA-03-35 0.81 37300 21  EMA-03-36 0.75 31300 22  EMA-03-37 0.45 0.50 29 14.4 35.7 17.6 40.1 10.2 18.8 na EMA-03-03 0.76 6.0 10.0 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-03-35 0.81 37300 21  EMA-02-10 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EMA-03-03 0.75 31300 22  EMA-03-36 0.75 31300 22  EMA-03-37 0.85 0.81 37300 21  EMA-03-38 0.75 31300 22  EMA-03-39 0.75 31300 22  EMA-03-10 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EMA-03-03 0.75 63300 62  EUA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-03-36 0.75 31300 22  EUA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-03-36 0.75 63300 62  EUA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-03-36 0.75 63300 62  EUA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-03-35 0.81 37300 71  EUA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 22.4 na na EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na na EUA-01-20 0.83 4880 20 17.9 29.6 19.5			ELA-02-65	0.52	13100		1						
ELA-03				0.59	4000		1						
ELA-03 69 0.43 9750 76 20.1 29.2 18.9 31.1 7.7 na 25.9   ELA-03-72 0.16 2090 11   ELA-03-71 0.22 620 14   ELA-03-72 0.19 1850 73   EMA-01-01 0.43 10000 36 20.8 31.0 23.6 26.7 9.8 23.8 25.9   EMA-01-02 0.61 2270 17 14.5 33.4 22.2 27.0 8.7 25.1 na   EMA-01-03 0.73 2345 18 22.1 31.4 19.0 na 8.8 na  na   EMA-01-05 0.50 11400 46   EMA-01-06 0.91 13400 71   HHFL-05 0.74 2300 19   EMA-02-07 0.65 20100 33 12.6 29.7 22.5 23.8 7.9 18.9 26.4   EMA-02-08 0.84 3740 18 13.5 32.6 17.1 na  8.2 20.0 na   EMA-02-09 1.1 12200 22 15.7 39.0 20.2 25.1 9.5 na  na   EMA-02-10 0.69 19300 49   EMA-02-11 0.47 13900 55   EMA-02-11 0.47 13900 55   EMA-02-12 0.87 23500 39   EMA-03-33 0.30 3460 16 14.5 31.8 19.3 36.1 8.5 24.6 na   EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na   EMA-03-35 0.81 37300 21   EMA-03-35 0.81 37300 21   EMA-03-35 0.81 37300 21   EMA-03-35 0.81 37300 21   EMA-03-36 0.75 31300 22   EMA-01-10 0.83 4880 20 17.9 29.6 19.5 25.8 6.6 21.6 na   EMA-01-10 0.83 4880 20 17.9 29.6 19.5 25.8 6.6 21.6 na   EMA-01-10 0.83 4880 20 17.9 29.6 19.5 25.8 6.6 21.6 na   EMA-01-10 0.83 4880 20 17.9 29.6 19.5 25.8 6.6 21.6 na   EMA-02-10 0.83 4880 20 17.9 29.6 19.5 25.8 6.6 21.6 na   EMA-02-12 0.30 3950 51   EUA-01 EMA-02-40 0.39 2140 33 22.4 29.4 9.0 29.8 8.2 22.4 na   EUA-01 EMA-02-40 0.39 2140 33 22.4 29.4 9.0 29.8 8.2 22.4 na   EUA-01 EUA-01-20 0.30 3050 51   EUA-02-26 1.3 6880 14 19.3 31.2 19.6 27.4 8.2 24.7 na   EUA-02-26 1.3 6880 14 19.3 31.2 19.6 27.4 8.2 24.7 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na  82 19.4 na   EUA-03-26 0.93 4490 46			ELA-03-67	1.6	14300	52	19.3	28.3	17.0	29.3	8.2	na	22.2
ELA-03-70 0.16 2090 111 ELA-03-71 0.22 620 14 ELA-03-72 0.19 1850 73  EMA-01-01 0.43 10000 36 20.8 31.0 23.6 26.7 9.8 23.8 25.9  EMA-01-02 0.61 2270 177 14.5 33.4 22.2 27.0 8.7 25.1 na na na na EMA-01-03 0.73 2345 18 22.1 31.4 19.0 na 8.8 na na na EMA-01-03 0.73 2345 18 22.1 31.4 19.0 na 8.8 na na na EMA-01-05 0.50 11400 46  EMA-01-05 0.50 11400 46  EMA-01-05 0.50 11400 46  EMA-02-07 0.65 20100 33 12.6 29.7 22.5 23.8 7.9 18.9 26.4 EMA-02-09 1.1 12200 22 15.7 39.0 20.2 25.1 9.5 na na na EMA-02-01 0.69 19300 49 EMA-02-10 0.69 19300 49  EMA-02-11 0.47 13000 55  EMA-02-11 0.47 13000 55  EMA-03-31 0.30 3460 16 14.5 31.8 19.3 36.1 8.5 24.6 na na EMA-03-31 0.30 3400 12 15.2 34.5 15.0 34.3 8.7 24.1 na EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 22 EMA-03-35 0.81 37300 22 EMA-03-30 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EMA-03-35 0.81 37300 22 EMA-03-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EMA-03-22 0.30 30.5 51 EMA-03-23 0.30 30.5 51 EMA-03-24 0.05 6360 62 EMA-01-24 0.05 6360 62 EMA-01-24 0.05 6360 62 EMA-01-24 0.05 6360 62 EMA-02-24 0.05 6360 62 EMA-02-25 1.3 6980 144 19.3 31.2 19.6 27.4 8.2 24.7 na EMA-03-36 1.3 6980 144 19.3 31.2 19.6 27.4 8.2 24.7 na EMA-03-37 1.0 EMA-03-37 1.0 10 EMA-03-26 0.05 4760 69 EMA-03-27 1.0 10.00 68 EMA-03-27 1.0 10.00 68 EMA-03-27 1.0 10.00 68 EMA-03-27 1.0 10.00 68 EMA-03-27 1.0 10.00 68 EMA-03-27 1.0 10.00 68 EMA-03-27 1.0 10.00 68 EMA-03-27 1.0 10.00 68 EMA-03-28 0.05 4760 69 EMA-03-28 0.05 4760 69 EMA-03-28 0.05 4760 69 EMA-03-28 0.05 4760 69 EMA-03-28 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-28 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-03-29 0.05 4760 69 EMA-0			ELA-03-68	0.37	3110		21.0	18.8	15.8	27.9	6.9	na	27.7
ELA-03-70 0.16 2090 11 ELA-03-71 0.22 620 14 ELA-03-72 0.19 1880 73  EMA-01-01 0.43 10000 36 20.8 31.0 23.6 26.7 9.8 23.8 25.9  EMA-01-02 0.61 2270 17 14.5 33.4 22.2 27.0 8.7 25.1 na  EMA-01-03 0.73 2345 18 22.1 31.4 19.0 na 8.8 na na  EMA-01-05 0.50 11400 46  EMA-01-06 0.91 13400 71  HHH-05 0.74 2300 19  EMA-02-07 0.65 20100 33 12.6 29.7 22.5 23.8 7.9 18.9 26.4  EMA-02-09 1.1 12200 22 15.7 39.0 20.2 25.1 9.5 na na  EMA-02-10 0.69 19300 49  EMA-02-11 0.47 23500 39  EMA-02-11 0.47 13000 55  EMA-02-12 0.87 23500 39  EMA-02-13 0.30 3460 16 14.5 31.8 19.3 36.1 8.5 24.6 na  EMA-03-32 0.43 30300 12 15.2 34.5 15.0 34.3 8.7 24.1 na  EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na  EMA-03-35 0.81 37300 21  EMA-03-36 0.75 31300 22  EMA-03-36 0.75 31300 22  EMA-03-36 0.75 31300 22  EMA-03-37 0.81 37300 21  EMA-03-38 0.75 31300 22  EMA-03-39 0.81 37300 21  EMA-03-30 0.81 37300 21  EMA-03		EI A 02	ELA-03-69	0.43	9750	76	20.1	29.2	18.9	31.1	7.7	na	25.9
ELA-03-72		ELA-03	ELA-03-70	0.16	2090	11							
EMA-01-02			ELA-03-71	0.22	620		1						
EMA-01 2 0.61 2270 17 14.5 33.4 22.2 27.0 8.7 25.1 na EMA-01 EMA-01-03 0.73 2345 18 22.1 31.4 19.0 na 8.8 na na na EMA-01-06 0.91 13400 71 HHFL-05 0.74 2300 19 EMA-02-07 0.65 20100 33 12.6 29.7 22.5 23.8 7.9 18.9 26.4 EMA-02-07 0.65 20100 33 12.6 29.7 22.5 23.8 7.9 18.9 26.4 EMA-02-07 0.65 20100 33 12.6 17.1 na 8.2 20.0 na EMA-02-07 0.65 20100 33 12.6 17.1 na 8.2 20.0 na EMA-02-08 0.84 3740 18 13.5 32.6 17.1 na 8.2 20.0 na EMA-02-10 0.69 139300 49 EMA-02-11 0.47 13000 55 EMA-02-12 0.87 23500 39 EMA-02-11 0.47 13000 55 EMA-02-12 0.87 23500 39 EMA-02-11 0.47 13000 55 EMA-02-12 0.87 23500 39 EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 22 EMA-03-35 0.81 37300 22 EMA-03-36 0.75 37300 22 EMA-03-36 0.75 37300 22 EMA-03-36 0.75 37300 22 EMA-03-36 0.75 37300 22 EMA-03-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EMA-03-10 2.0 84 880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 19.4 na na na EMA-03-12 0.90 3790 7 16.4 31.8 18.6 27.6 8.2 19.4 na na na EMA-03-13 0.90 3790 7 16.4 31.8 18.6 32.1 19.6 23.0 EMA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EMA-03-29 0.86 4790 46			ELA-03-72	0.19	1850		1						
EMA-01-03 0.73 2345 18 22.1 31.4 19.0 na 8.8 na na ema ema ema ema ema ema ema ema ema em			EMA-01-01									23.8	25.9
EMA-01  EMA-01-04  EMA-01-05  EMA-01-05  EMA-01-06  EMA-01-06  EMA-02-07  EMA-02-07  EMA-02-07  EMA-02-08  EMA-02-09  EMA-02-10  EMA-03-31  EMA-03-31  EMA-03-32  EMA-03-32  EMA-03-33  A160			EMA-01-02	0.61				33.4	22.2	27.0	8.7	25.1	na
### EMA-01-05							22.1	31.4	19.0	na	8.8	na	na
### EMA-01-06		EMA-01	EMA-01-04										
### HFIFL-05			EMA-01-05	0.50	11400	46							
EMA-02  EMA-02-07  EMA-02-08  EMA-02-09  EMA-02-09  EMA-02-10  EMA-02-10  EMA-02-10  EMA-02-11  EMA-02-11  EMA-02-11  EMA-02-11  EMA-02-11  EMA-02-12  EMA-02-13  EMA-02-13  EMA-02-14  EMA-02-15  EMA-02-15  EMA-02-15  EMA-02-16  EMA-02-16  EMA-02-17  EMA-02-17  EMA-02-17  EMA-02-18  EMA-03-31  O.87  EMA-03-32  O.43  O.43  O.45  O.75  O			EMA-01-06	0.91	13400	71							
EMA-02 08 0.84 3740 18 13.5 32.6 17.1 na 8.2 20.0 na EMA-02-09 1.1 12200 22 15.7 39.0 20.2 25.1 9.5 na na na EMA-02-00 10.69 19300 49 EMA-02-11 0.47 13000 55 EMA-02-12 0.87 23500 39 EMA-03-31 0.30 3460 16 14.5 31.8 19.3 36.1 8.5 24.6 na EMA-03-32 0.43 30300 12 15.2 34.5 15.0 34.3 8.7 24.1 na EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 21 EMA-03-36 0.75 31300 22 EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na na EUA-01-21 2.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EUA-01-21 2.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na na EUA-01-22 0.30 0.30 3050 51 EUA-01-23 0.78 4370 10 EUA-01-24 0.75 6360 62 EUA-02-44 0.039 2140 33 22.4 29.4 9.0 29.8 8.2 22.4 na EUA-02-45 0.32 2700 73 23.0 32.2 18.0 22.1 8.8 na na EUA-02-48 1.3 5380 24 EUA-02-48 1.3 5380 24 EUA-02-48 1.3 5380 24 EUA-03-29 0.86 4790 46			HHFL-05	0.74	2300	19	1						
EMA-02-9			EMA-02-07	0.65	20100	33	12.6	29.7	22.5	23.8	7.9	18.9	26.4
EMA-02-11 0.47 13000 55 EMA-02-12 0.87 23500 39 EMA-02-13 0.30 3460 16 14.5 31.8 19.3 36.1 8.5 24.6 na EMA-03-31 0.30 3460 16 15.2 34.5 15.0 34.3 8.7 24.1 na EMA-03-32 0.43 30300 12 15.2 34.5 15.0 34.3 8.7 24.1 na EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 22 EMA-03-35 0.81 37300 22 EMA-03-36 0.75 31300 22 EMA-03-36 0.75 31300 22 EMA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-01-12 2.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EUA-01-21 2.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EUA-01-22 0.30 3050 51 EUA-01-23 0.78 4370 10 EUA-01-24 0.75 6360 62 EUA-01-24 0.75 6360 62 EUA-02-44 0.039 2140 33 22.4 29.4 9.0 29.8 8.2 22.4 na EUA-02-45 0.32 2700 73 23.0 32.2 18.0 22.1 8.8 na na EUA-02-46 0.054 7600 69 EUA-02-47 1.0 14000 68 EUA-02-48 1.3 5380 24 EUA-02-48 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-29 0.86 4790 46	<u>e</u>		EMA-02-08	0.84	3740		13.5		17.1	na	8.2	20.0	na
EMA-02-11 0.47 13000 55 EMA-02-12 0.87 23500 39 EMA-02-13 0.30 3460 16 14.5 31.8 19.3 36.1 8.5 24.6 na EMA-03-31 0.30 3460 16 15.2 34.5 15.0 34.3 8.7 24.1 na EMA-03-32 0.43 30300 12 15.2 34.5 15.0 34.3 8.7 24.1 na EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 22 EMA-03-35 0.81 37300 22 EMA-03-36 0.75 31300 22 EMA-03-36 0.75 31300 22 EMA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EMA-01-12 2.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EUA-01-21 2.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EUA-01-22 0.30 3050 51 EUA-01-23 0.78 4370 10 EUA-01-24 0.75 6360 62 EUA-01-24 0.75 6360 62 EUA-02-44 0.039 2140 33 22.4 29.4 9.0 29.8 8.2 22.4 na EUA-02-45 0.32 2700 73 23.0 32.2 18.0 22.1 8.8 na na EUA-02-46 0.054 7600 69 EUA-02-47 1.0 14000 68 EUA-02-48 1.3 5380 24 EUA-02-48 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-29 0.86 4790 46	ള	ΕMΔ-02	EMA-02-09	1.1	12200		15.7	39.0	20.2	25.1	9.5	na	na
EMA-02-12 0.87 23500 39  EMA-03-31 0.30 3460 16 14.5 31.8 19.3 36.1 8.5 24.6 na EMA-03-31 0.30 3400 12 15.2 34.5 15.0 34.3 8.7 24.1 na EMA-03-32 0.43 30300 12 15.2 34.5 15.0 34.3 8.7 24.1 na EMA-03-33 0.45 7050 29 14.4 35.7 17.6 40.1 10.2 18.8 na EMA-03-34 0.51 4920 27 EMA-03-35 0.81 37300 21 EMA-03-35 0.81 37300 21 EMA-03-36 0.75 31300 22  EMA-03-36 0.75 31300 22  EUA-01-19 2.6 4010 16 14.9 30.9 18.4 24.3 7.8 23.8 29.7 EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na EUA-01-21 2.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na EUA-01-22 0.30 3050 51 EUA-01-22 0.30 3050 51 EUA-01-23 0.78 4370 10 EUA-01-24 0.75 6360 62 EUA-02-44 0.039 2140 33 22.4 29.4 9.0 29.8 8.2 22.4 na EUA-02-45 0.32 2700 73 23.0 32.2 18.0 22.1 8.8 na na EUA-02-45 0.32 2700 73 23.0 32.2 18.0 22.1 8.8 na na EUA-02-47 1.0 14000 68 EUA-02-48 1.3 5380 24 EUA-02-48 1.3 5380 24 EUA-02-47 1.0 14000 68 EUA-02-48 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-28 0.35 4160 9 EUA-03-29 0.86 4790 46	2	LIVINGE											
EMA-03-31													
EMA-03								T					
EMA-03 3													
EMA-03-34													
EMA-03-34		EMA-03					14.4	35.7	17.6	40.1	10.2	18.8	na
EMA-03-36													
EUA-01-19							4						
EUA-01-20 0.83 4880 20 17.9 29.6 19.5 25.8 8.6 21.6 na  EUA-01-21 2.90 3790 7 16.4 31.8 18.6 27.6 8.2 na na  EUA-01-22 0.30 3050 51  EUA-01-23 0.78 4370 10  EUA-01-24 0.75 6360 62  EUA-02-44 0.039 2140 33 22.4 29.4 9.0 29.8 8.2 22.4 na  EUA-02 EUA-02-45 0.32 2700 73 23.0 32.2 18.0 22.1 8.8 na na  EUA-02-46 0.054 7600 69  EUA-02-47 1.0 14000 68  EUA-02-48 1.3 5380 24  EUA-03-25 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na  EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na  EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na  EUA-03-29 0.86 4790 46	<u> </u>						14.0	20.0	10.4	1 040	70	22.0	20.7
EUA-01													
EUA-01-22													
EUA-01-23		EUA-01					10.4	31.0	10.0	21.0	0.2	Пd	Hä
EUA-01-24 0.75 6360 62  EUA-02-43 0.47 5855 86 24.1 27.0 24.2 25.0 8.2 19.6 23.0 EUA-02-44 0.039 2140 33 22.4 29.4 9.0 29.8 8.2 22.4 na EUA-02-45 0.32 2700 73 23.0 32.2 18.0 22.1 8.8 na na na EUA-02-46 0.054 7600 69 EUA-02-47 1.0 14000 68 EUA-02-48 1.3 5380 24  EUA-03-25 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-29 0.86 4790 46							-						
EUA-02  EUA-02  EUA-02  EUA-02-43  EUA-02-44  0.039  2140  33  22.4  29.4  9.0  29.8  8.2  22.4  na  EUA-02-45  EUA-02-45  EUA-02-46  EUA-02-47  1.0  14000  68  EUA-02-48  1.3  5380  24   EUA-03-25  1.3  6950  14  19.3  31.2  19.6  27.4  8.2  24.7  na  EUA-03-26  EUA-03-27  0.27  10700  10  18.6  30.9  23.0  32.2  18.0  24.1  25.0  8.2  19.6  23.0  22.4  na  na  na  na  na  na  EUA-02-45  EUA-03-26  0.054  7600  69  EUA-03-25  1.3  6950  14  19.3  31.2  19.6  27.4  8.2  24.7  na  EUA-03-26  EUA-03-27  0.27  10700  10  18.6  30.9  23.6  na  10.8  18.7  na  EUA-03-29  0.86  4790  46							-						
EUA-02  EUA-02  EUA-02-44  EUA-02-45  EUA-02-46  EUA-02-46  EUA-02-47  EUA-02-47  EUA-02-48  EUA-02-48  EUA-02-48  EUA-02-48  EUA-03-25  EUA-03-26  EUA-03-27  EUA-03-27  EUA-03-28  EUA-03-29  EUA-03							2/ 1	27.0	24.2	25.0	82	10.6	23.0
EUA-02 EUA-02-45 0.32 2700 73 23.0 32.2 18.0 22.1 8.8 na na na EUA-02-46 0.054 7600 69 EUA-02-47 1.0 14000 68 EUA-02-48 1.3 5380 24 EUA-03-25 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-29 0.86 4790 46													
EUA-02-47 1.0 14000 68 EUA-02-48 1.3 5380 24  EUA-03-25 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-28 0.35 4160 9 EUA-03-29 0.86 4790 46	ē												
EUA-02-47 1.0 14000 68 EUA-02-48 1.3 5380 24  EUA-03-25 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-28 0.35 4160 9 EUA-03-29 0.86 4790 46	dd	EUA-02					20.0	JZ.Z	10.0	44.1	0.0	Πα	Πα
EUA-02-48 1.3 5380 24  EUA-03-25 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na  EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na  EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na  EUA-03-28 0.35 4160 9  EUA-03-29 0.86 4790 46							1						
EUA-03-25 1.3 6950 14 19.3 31.2 19.6 27.4 8.2 24.7 na EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-28 0.35 4160 9 EUA-03-29 0.86 4790 46							1						
EUA-03-26 0.91 4560 18 18.8 33.2 18.4 na 8.2 19.4 na EUA-03-27 0.27 10700 10 18.6 30.9 23.6 na 10.8 18.7 na EUA-03-28 0.35 4160 9 EUA-03-29 0.86 4790 46							19.3	31 2	19.6	27 4	8.2	24 7	na
EUA-03													
EUA-03-28 0.35 4160 9 EUA-03-29 0.86 4790 46													
EUA-03-29 0.86 4790 46		EUA-03											
							1						

### Table A-20 Sediment and Aquatic Biota Tissue Percent Solids Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

								%	Solids			
EDR	BSA	Sediment Location	Sediment	Sediment TOC	Percent Fines	Aquatic Plants	Emergent Insects	Benthic Invertebrates	Crayfish	Mollusks	Frog	Snake
		ERA-01-49	0.007	2450	13	20.2	32.0	17.5	na	10.4	na	26.2
		ERA-01-50	0.024	16200	73	21.2	31.8	22.2	na	10.4	na	25.2
	ERA-01	ERA-01-51	0.007	575	28	21.4	28.2	16.7	na	8.8	na	23.4
	LIVA-01	ERA-01-52	0.008	610	34							
		ERA-01-53	0.008	2360	29							
		ERA-01-54	0.014	26000	64							
		ERA-02-13	0.006	7340	7	20.1	28.0	19.5	24.3	7.3	19.7	23.9
9		ERA-02-14	0.013	26700	38	23.2	26.6	21.4	29.4	6.5	17.6	na
Reference	ERA-02	ERA-02-15	0.034	36200	15	16.8	33.2	17.2	24.5	9.0	na	na
Je Je	ERA-02	ERA-02-16	0.008	6830	55			-	-			
8		ERA-02-17	0.008	3580	16							
		ERA-02-18	0.008	5180	30							
		ERA-03-37	0.11	128000	7	20.2	27.2	15.9	na	6.5	21.1	30.6
		ERA-03-38	0.032	34600	30	21.9	30.0	15.7	na	7.4	na	29.6
	EDA 02	ERA-03-39	0.041	26500	10	21.8	30.6	15.7	na	7.6	na	na
	ERA-03	ERA-03-40	0.007	2480	9			•	•	•		•
		ERA-03-41	0.007	5320	6	1						
		ERA-03-42	0.041	48300	35							

### **General Note:**

Red text indicates value is shown at half the reporting limit

### **Acronyms and Abbreviations:**

BSA = biological sampling area
EDR = ecologically distinct reach
mg/kg = milligrams per kilogram
na = no sample aquired in specified area
OU = Operable Unit
PCB = polychlorinated biphenyl

## $\label{eq:Table A-21} \mbox{ Correlation Analysis of PCBs in Sediment and Biotic Tissues - $r^2$ Values}$

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

			Sedimen	t Measurement	
Tissue Type	Measure	Aroclor - DW	Homolog - DW	Aroclor TOC Normal - DW	Aroclor Fines Normal - DW
	DW	0.03	0.23	0.00	0.20
Aquatic Plants	WW	0.00	0.02	0.01	0.03
	Lipid Normal - WW	0.07	0.27	0.00	0.23
	DW	0.01	0.06	0.00	0.04
Emergent Insects	WW	0.00	0.06	0.00	0.03
maccia	Lipid Normal - WW	0.02	0.06	0.00	0.06
Benthic	DW	0.00	0.24	0.00	0.33 (0.11)
Invertebrates	WW	0.03	0.25	0.00	0.50 (0.03)
Invertebrates	Lipid Normal - WW	0.00	0.24	0.03	0.18
	DW	0.33	0.24	0.01	0.02
Crayfish	WW	0.47	0.28	0.00	0.04
	Lipid Normal - WW	0.21	0.57	0.01	0.18
	DW	0.00	0.01	0.00	0.11
Mollusks	WW	0.00	0.01	0.01	0.03
	Lipid Normal - WW	0.19	0.00	0.02	0.01
	DW	0.09	0.02	0.11	0.05
Frogs	WW	0.08	0.03	0.12	0.06
	Lipid Normal - WW	0.14	0.00	0.05	0.04
	DW	0.61	0.40	0.04	0.39
Snakes	WW	0.62	0.45	0.03	0.38
	Lipid Normal - WW	0.40	0.21	0.00	0.26

DW = dry weight

WW = wet weight

TOC - total organic carbon

Red values indicate that regression showed a negative correlation (See Figure A-26)

 $r^2$  = the coefficient of determination

Highlighted cells indicate an  $r^2$  value  $\geq 0.3$  and a p value < 0.1

(p values in parenthesis) - p value of 0.1 indicates statistical significance at a probability of 90% p values calculated only for positive correlations with  $r^2 > 0.3$ 

## $\label{eq:Table A-22} \mbox{ Correlation Analysis of log PCBs in Sediment and Biotic Tissues - $r^2$ Values}$

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

			Sediment N	leasurement	
Tissue Type	Measure	Aroclor - DW	Homolog - DW	Aroclor TOC Normal - DW	Aroclor Fines Normal - DW
	DW	0.00	0.01	0.00	0.04
Aquatic Plants	WW	0.01	0.00	0.03	0.01
	Lipid Normal - WW	0.00	0.03	0.00	0.06
Con a recent	DW	0.01	0.00	0.03	0.04
Emergent Insects	WW	0.00	0.00	0.02	0.03
mocoto	Lipid Normal - WW	0.01	0.00	0.03	0.05
Dandhia	DW	0.00	0.10	0.01	0.20
Benthic Invertebrates	ww	0.01	0.04	0.00	0.37 (0.08)
invertebrates	Lipid Normal - WW	0.00	0.32 (0.24)	0.01	0.12
	DW	0.38	0.20	0.00	0.01
Crayfish	WW	0.46	0.19	0.03	0.02
	Lipid Normal - WW	0.17	0.61	0.00	0.12
	DW	0.00	0.08	0.01	0.06
Mollusks	WW	0.00	0.05	0.03	0.01
	Lipid Normal - WW	0.13	0.15	0.00	0.00
	DW	0.14	0.00	0.19	0.04
Frogs	WW	0.08	0.01	0.17	0.03
	Lipid Normal - WW	0.24	0.03	0.31 (0.19)	0.08
	DW	0.84	0.58	0.04	0.60
Snakes	WW	0.84	0.62	0.03	0.55
	Lipid Normal - WW	0.53	0.37	0.02	0.47

DW = dry weight WW = wet weight TOC - total organic carbon

Red values indicate that regression showed a negative correlation (See Figure A-27)

### Highlighted cells indicate an r<sup>2</sup> value > 0.3 and a p value < 0.1

(p values in parenthesis) - p value of 0.1 indicates statistical significance at a probability of 90% p values calculated only for positive correlations with  $r^2 > 0.3$ 

 $r^2$  = the coefficient of determination

### Table A-23 Correlation Analysis of Mercury in Sediment and Biotic Tissues - ${\bf r}^2$ Values

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

		Sediment Measurement				
Tissue Type	Measure	Hg - DW	Hg Fines Normal - DW			
Aquatic Plants	DW	0.16	0.09			
Aquatic Flants	WW	0.17	0.13			
Emergent Insects	DW	0.01	0.01			
Emergent insects	WW	0.01	0.01			
Donthio Invertebrates	DW	0.14	0.43			
Benthic Invertebrates	WW	0.16	0.37			
Crayfish	DW	0.01	0.22			
Crayiisii	WW	0.00	0.27			
Mollusks	DW	0.06	0.27			
IVIOIIUSKS	WW	0.17	0.31			
Frage	DW	0.21	0.35 (0.16)			
Frogs	WW	0.26	0.40 (0.12)			
Snakes	DW	0.05	0.05			
Snakes	WW	0.02	0.01			

### Notes:

DW = dry weight WW = wet weight

Red values indicate that regression showed a negative correlation (See Figure A-28)

(p values in parenthesis) - p value of 0.1 indicates 90% probability that the slope of the regression is significantly different from zero

p values calculated only for positive correlations with  $r^2 > 0.3$ 

 $r^2$  = the coefficient of determination

### 

### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Anniston PCB Site, Anniston, Alabama

		Sediment Measurement			
Tissue Type	Measure	Hg - DW	Hg Fines Normal - DW		
Aquatic Plants	DW	0.23	0.19		
Aquatic Flants	WW	0.14	0.17		
Emergent Insects	DW	0.00	0.00		
Emergent insects	WW	0.00	0.00		
Benthic Invertebrates	DW	0.14	0.50		
Benunc invertebrates	WW	0.14	0.31		
Croyfish	DW	0.00	0.17		
Crayfish	WW	0.01	0.20		
Mollusks	DW	0.13	0.45		
WOIIUSKS	WW	0.25	0.51		
Frage	DW	0.28	0.46 (0.09)		
Frogs	WW	0.20	0.46 (0.10)		
Snakes	DW	0.01	0.02		
Snakes	WW	0.00	0.00		

### Notes:

DW = dry weight WW = wet weight

Red values indicate that regression showed a negative correlation (See Figure A-29)

 $r^2$  = the coefficient of determination

Highlighted cells indicate an r<sup>2</sup> value > 0.3 and a p value < 0.1

(p values in parenthesis) - p value of 0.1 indicates 90% probability that the slope of the regression is significantly different from zero p values calculated only for positive correlations with  $r^2 > 0.3$ 

### Table A-25 Sediment and Aquatic Biota Tissue for Metals Data and BAF Calculation Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Evaluation Technical Memorandum Anniston PCB Site, Anniston, Alabama

		Measured Concentrations (mg/kg) (dw)								
Sample ID	Barium	Chromium	Cobalt	Lead	Manganese	Nickel	Vanadium			
Sediment										
ELA-01	18.95	8.15	2.45	7.05	146	2.30	5.05			
ELA-02	26.90	8.50	3.40	8.40	110	3.20	5.30			
EMA-01	33.00	7.60	3.50	8.00	271	3.80	5.00			
EMA-03	33.90	7.60	2.30	4.30	171	2.40	3.40			
EUA-02	82.90	16.90	7.00	13.90	397	4.40	17.20			
EUA-03	35.10	18.10	4.10	10.40	354	5.00	7.40			
ERA-01	90.90	8.30	8.50	12.60	245	6.20	11.00			
ERA-03	84.70	30.90	14.90	12.60	537	11.90	34.30			
HHFL-04	14.30	13.60	3.90	9.20	86	3.40	7.60			
HHFL-05	24.10	6.30	2.55	5.95	217	2.25	3.15			
C-005-SED-2	47.50	20.80	10.50	10.20	519	9.20	9.40			
ECO-REF-01	42.80	4.50	3.90	6.20	45	3.70	6.30			
ECO-REF-02	110.00	8.20	8.10	11.60	442	6.40	11.40			
ECO-REF-03	24.80	26.60	6.70	8.00	248	8.40	17.30			
Average	47.85	13.29	5.84	9.17	271	5.18	10.27			
<b>Aquatic Plants</b>										
ELA-01	66	1.15	2.87	1.78	1274	0.64	1.15			
EMA-03	50	3.1	34.72	3.96	861	0.97	1.94			
EUA-02	70	FALSE	20.75	7.05	1012	0.18	1.49			
ERA-03	118	4.6	5.02	1.92	1648	2.4	6.85			
Average	76	2.9	15.8	3.7	1199	1.1	2.9			
Ratio of	1.6	0.22	2.71	0.40	4.43	0.20	0.28			
Means BAF		0.22	2.71	0.40	4.43	0.20	0.20			
<b>Emergent Inse</b>	cts									
ELA-03	5.1	13	0.28	0.45	31	7.5	0.3425			
EMA-02	11	12	15.3	0.67	102	7.4	0.58			
EUA-02	4.4	6.8	17.0	0.29	18	1.6	6.8			
ERA-01	9.2	3.1	0.082	0.28	25	1.7	0.31			
Average	7.5	8.7	8.2	0.42	44	4.6	2.01			
Ratio of	0.16	0.66	1.40	0.05	0.16	0.9	0.196			
Means BAF	0.10	0.00	1.40	0.05	0.10	0.9	0.190			
Benthic Inverte	ebrates									
ELA-03	37	3.2	31.6	3.6	709	1.8	2.2			
EMA-03	37	3.9	4.3	5.0	1620	2.3	2.5			
EUA-02	60	3.3	4.4	6.0	3589	2.8	2.6			
ERA-01	29	1.6	2.4	1.6	1090	1.3	1.7			
Average	41	3.0	10.7	4.0	1752	2.0	2.2			
Ratio of Means BAF	0.86	0.23	1.83	0.44	6.5	0.39	0.22			

### Table A-25 Sediment and Aquatic Biota Tissue for Metals Data and BAF Calculation Summary

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Evaluation Technical Memorandum Anniston PCB Site, Anniston, Alabama

	Measured Concentrations (mg/kg) (dw)								
Sample ID	Barium	Chromium	Cobalt	Lead	Manganese	Nickel	Vanadium		
Crayfish									
ELA-01	107	7.2	18.1	0.94	402	0.054	7.2		
EUA-02	162	8.0	20.0	1.8	584	0.072	8.0		
EUA-03	199	1.4	18.2	3.3	1026	0.58	1.4		
Average	156	5.5	18.8	2.0	671	0.237	5.5		
Ratio of Means BAF	3.3	0.42	na	0.22	2.5	na	0.54		
Mollusks									
ELA-03	34	14	3.6	3.7	169	4.3	1.5		
EMA-03	27	9.6	3.9	4.5	172	2.1	1.9		
EUA-01	35	9.4	3.5	3.6	237	1.7	1.9		
ERA-03	42	6.2	5.9	1.7	511	4.1	5.5		
Average	34	9.7	4.2	3.4	272	3.1	2.7		
Ratio of Means BAF	0.72	0.73	0.72	0.37	1.0	0.59	0.26		
Frog									
ELA-03	9.91	9.01	22.52	0.77	40.54	0.090	9.01		
ERA-01	8.78	1.45	0.38	0.27	36.26	0.076	0.57		
Average	9.34	5.23	11.45	0.52	38.40	0.083	4.79		
Ratio of Means BAF	0.20	0.39	1.96	0.06	0.14	na	0.47		
Snake									
EUA-01	44	7.1	1.6	2.6	592	3.3	1.0		
EUA-01a	44	18	1.4	4.1	150	8.8	1.6		
Average	44	12.6	1.5	3.4	371	6.0	1.3		
Ratio of Means BAF	0.92	0.95	0.26	0.37	1.37	1.16	0.13		

### Notes:

Red text indicates value is shown at half the reporting limit

### **Acronyms and Abbreviations:**

BAF = bioaccumulation factor mg/kg = milligram/kilogram OU = Operable Unit PCB = polychlorinated biphenyl

### Table A-26 Summary of OU-1/OU-2 Bioaccumulation Factors

## Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix A - Bioaccumulation Factor Development Anniston PCB Site, Anniston, Alabama

Constituent	Sediment to Aquatic Plants	Sediment to Emergent Insects	Sediment to Benthic Invertebrates*	Sediment to Crayfish	Sediment to Mollusks	Sediment to Frog	Sediment to Snake
tPCB	0.42	3.8	0.92	0.75	6.50	3.40	26.91
Barium	1.59	0.16	0.86	3.26	0.72	0.20	0.92
Chromium	0.22	0.66	0.23	0.42	0.73	0.39	0.95
Cobalt	2.71	1.40	1.83	0.72	0.72	1.96	0.26
Lead	0.40	0.05	0.44	0.22	0.37	0.06	0.37
Manganese	4.43	0.16	6.48	2.48	1.01	0.14	1.37
Mercury	0.11	0.25	0.39	0.27	0.47	0.75	1.11
Nickel	0.20	0.88	0.39	0.59	0.59	1.16	1.16
Vanadium	0.28	0.20	0.22	0.54	0.26	0.47	0.13

### **General Notes:**

Equation based on log normalized sediment dry and tissue dry weight (log (tissue concentration dw) = 0.6272\*(log sediment PCBdw)+1.0224 BAFs calculated as dry weight tissue to dry weight sediment.

Values shown in italics could not be computed because all the tissue samples were non detected. For crayfish, mollusk value used as a surrogate. For frogs, snake value used as a surrogate

### **Acronyms and Abbreviations:**

BAF = bioaccumulation factor

OU = Operable Unit

PCB = polychlorinated biphenyl

tPCB = total polychlorinated biphenyl

<sup>\*</sup> PCB uptake also evaluated based on the regression equation from the laboratory data analysis (see Appendix A)



Figures

<u></u> < 1.0

<u>1.0 - 2.0</u>

<u>^</u> 2.0 - 5.0

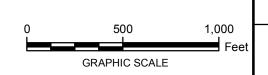
<u></u> > 10

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING 100-YR FLOODPLAIN

CREEK

# NOTE:

BSA = BIOLOGICAL SAMPLING AREA
EDR = ECOLOGICALLY DISTINCT DISTRICT
OU = OPERABLE UNIT



BIOLOGICAL SAMPLE AREA UPPER EDR: EUA-01



OU-4 PHASE II ECOLOGICAL SEDIMENT SAMPLE LOCATION PCB RESULT IN DEPTHS 0 - 6 IN

 $\triangle$  NO PCB RESULT

<u></u> < 1.0

<u>^</u> 2.0 - 5.0

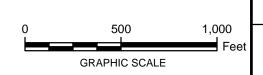
1.0 - 2.0

<u>△</u> 5.0 - 10 **△** > 10

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING 100-YR FLOODPLAIN CREEK

#### NOTE:

BSA = BIOLOGICAL SAMPLING AREA
 EDR = ECOLOGICALLY DISTINCT DISTRICT
 OU = OPERABLE UNIT



ANNISTON PCB SITE
ANNISTON, ALABAMA
STREAMLINED ECOLOGICAL RISK ASSESSMENT
FOR OU-1/OU-2 PORTION OF SNOW CREEK
APPENDIX A – BIOACCUMULATION FACTOR DEVELOPMENT

**BIOLOGICAL SAMPLE AREA** UPPER EDR: EUA-02



31TY: ROCH DIV/GROUP: 40 DB: LD: EAL PIC: AF PM: TM: MS TR: uniston

<u>^</u> 2.0 - 5.0

▲ > 1

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING
100-YR FLOODPLAIN
CREEK

### NOTE:

BSA = BIOLOGICAL SAMPLING AREA
 EDR = ECOLOGICALLY DISTINCT DISTRICT
 OU = OPERABLE UNIT



BIOLOGICAL SAMPLE AREA UPPER EDR: EUA-03



PCB RESULT IN DEPTHS 0 - 6 IN

<u></u> < 1.0

<u>^</u> 2.0 - 5.0

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING 100-YR FLOODPLAIN

CREEK

### NOTE:

BSA = BIOLOGICAL SAMPLING AREA
 EDR = ECOLOGICALLY DISTINCT DISTRICT
 OU = OPERABLE UNIT



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APPENDIX A – BIOACCUMULATION FACTOR DEVELOPMENT

**BIOLOGICAL SAMPLE AREA** MIDDLE EDR: EMA-01, EMA-02, EMA-03





1.0 - 2.0

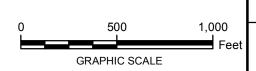
<u>^</u> 2.0 - 5.0 <u>^</u> 5.0 - 10

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING 100-YR FLOODPLAIN

CREEK

# NOTE:

BSA = BIOLOGICAL SAMPLING AREA
 EDR = ECOLOGICALLY DISTINCT DISTRICT
 OU = OPERABLE UNIT



BIOLOGICAL SAMPLE AREA LOWER EDR: ELA-01





<u></u> < 1.0

1.0 - 2.0

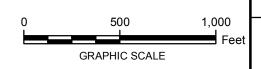
<u>^</u> 2.0 - 5.0 

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING 100-YR FLOODPLAIN

CREEK

# NOTE:

BSA = BIOLOGICAL SAMPLING AREA
 EDR = ECOLOGICALLY DISTINCT DISTRICT
 OU = OPERABLE UNIT



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APPENDIX A – BIOACCUMULATION FACTOR DEVELOPMENT

**BIOLOGICAL SAMPLE AREA** LOWER EDR: ELA-02, ELA-03





### LEGEND:

OU-4 PHASE II ECOLOGICAL SEDIMENT SAMPLE LOCATION PCB RESULT IN DEPTHS 0 - 6 IN

<u></u> < 1.0

1.0 - 2.0

<u>^</u> 2.0 - 5.0

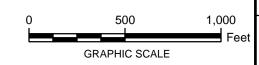
<u>▲</u> 5.0 - 10

<u></u> > 10

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING

# NOTE:

BSA = BIOLOGICAL SAMPLING AREA
EDR = ECOLOGICALLY DISTINCT DISTRICT
OU = OPERABLE UNIT



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FOR OU-1/OU-2 PORTION OF SNOW CREEK
APPENDIX A – BIOACCUMULATION FACTOR DEVELOPMENT

BIOLOGICAL SAMPLE AREA REFERENCE AREA 1: ERA-01





OU-4 PHASE II ECOLOGICAL SEDIMENT SAMPLE LOCATION PCB RESULT IN DEPTHS 0 - 6 IN

<u></u> < 1.0

1.0 - 2.0

<u>^</u> 2.0 - 5.0

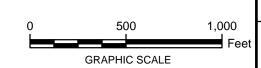
△ 5.0 - 10

<u></u>▲ > 10

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING

# NOTE:

BSA = BIOLOGICAL SAMPLING AREA
 EDR = ECOLOGICALLY DISTINCT DISTRICT
 OU = OPERABLE UNIT



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APPENDIX A – BIOACCUMULATION FACTOR DEVELOPMENT

BIOLOGICAL SAMPLE AREA REFERENCE AREA 2: ERA-02



LEGEND:

OU-4 PHASE II ECOLOGICAL SEDIMENT SAMPLE LOCATION PCB RESULT IN DEPTHS 0 - 6 IN

<u></u> < 1.0

1.0 - 2.0

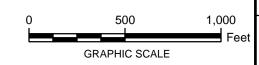
△ 2.0 - 5.0 △ 5.0 - 10

<u>▲</u> > 10

APPROXIMATE AREA OF AQUATIC BSA - OU-4 PHASE II ECOLOGICAL SAMPLING

### NOTE:

BSA = BIOLOGICAL SAMPLING AREA
 EDR = ECOLOGICALLY DISTINCT DISTRICT
 OU = OPERABLE UNIT



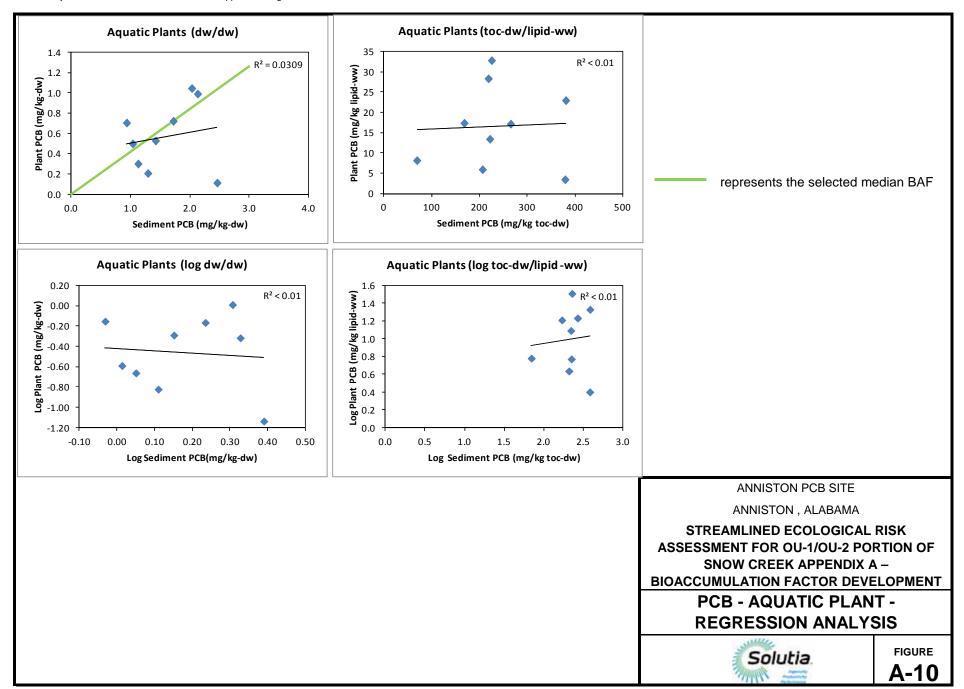
ANNISTON PCB SITE
ANNISTON, ALABAMA
STREAMLINED ECOLOGICAL RISK ASSESSMENT
FOR OU-1/OU-2 PORTION OF SNOW CREEK
APPENDIX A – BIOACCUMULATION FACTOR DEVELOPMENT

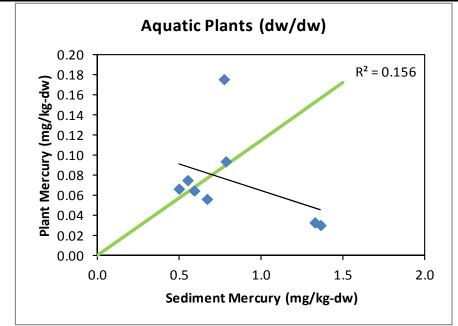
BIOLOGICAL SAMPLE AREA REFERENCE AREA 3: ERA-03

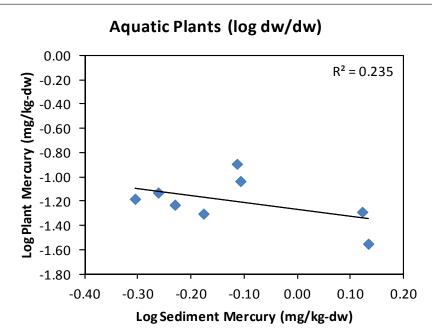


FIGURE A-9

Glty: SYR Div/Group: SWG Created By: K.Ives Last Saved By: kives Amiston Amiston DCB. SitelAnniston-ALWXDs. Printfiles/Reports/OU1\_2\_SERA\_2013/mxd/EcoFigs9\_Tiss







represents the selected median BAF

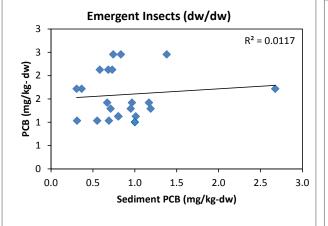
ANNISTON PCB SITE

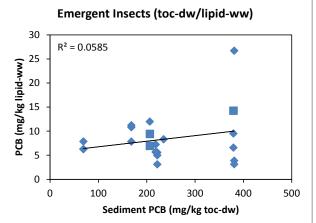
ANNISTON, ALABAMA

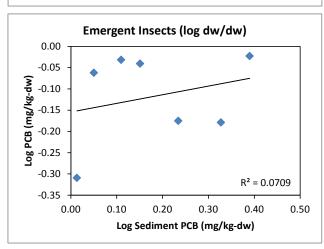
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

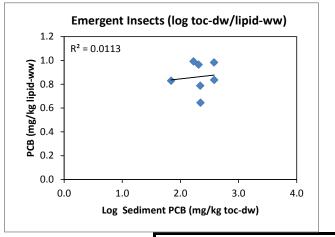
MERCURY - AQUATIC PLANT - REGRESSION ANALYSIS











\* Data for emergent insects was divided into two populations (crane fly only and mixed species), therefore regressions represent the mixed species population of emergent insects.

ANNISTON PCB SITE ANNISTON , ALABAMA

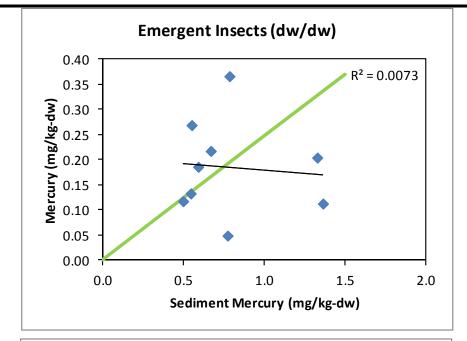
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

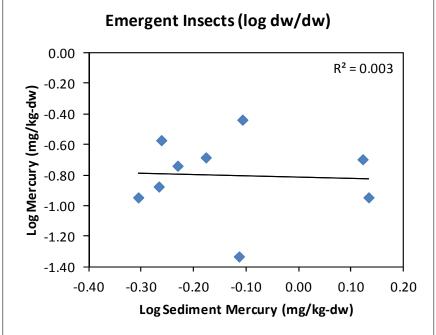
PCB - EMERGENT INSECT\* - REGRESSION ANALYSIS



**FIGURE** 

**A-12** 





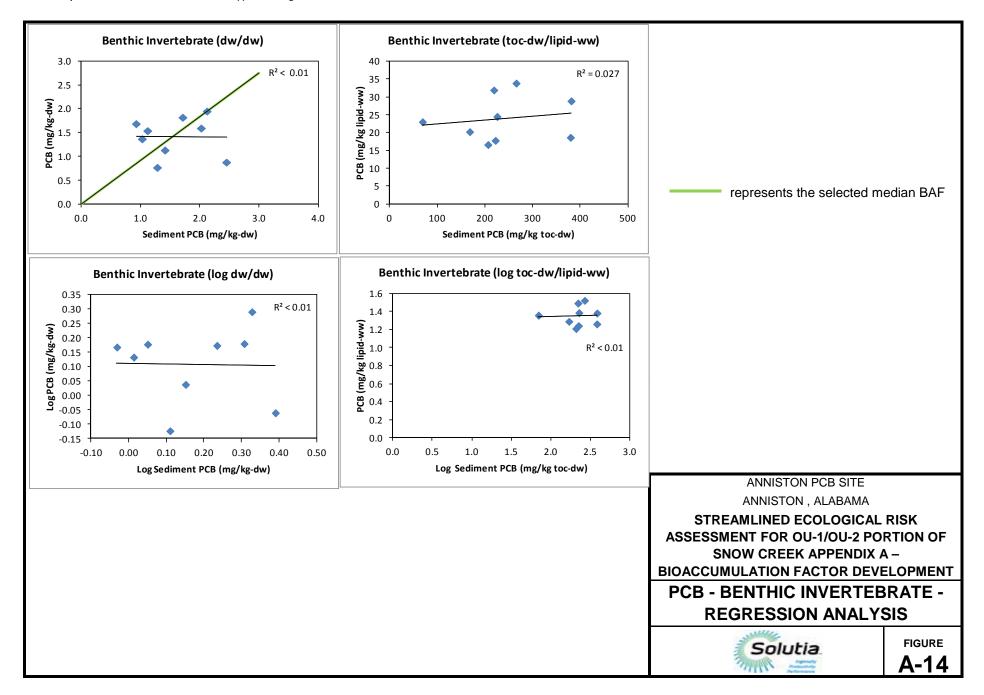
represents the selected median BAF

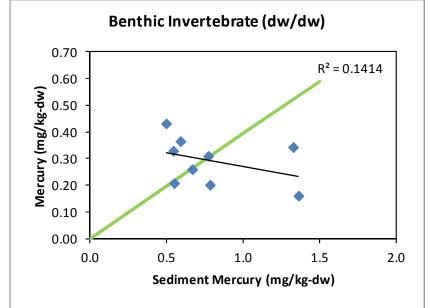
ANNISTON PCB SITE ANNISTON , ALABAMA

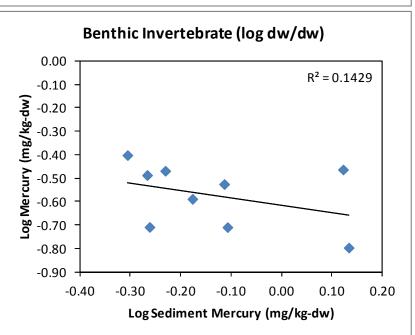
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

MERCURY - EMERGENT INSECT - REGRESSION ANALYSIS









represents the selected median BAF

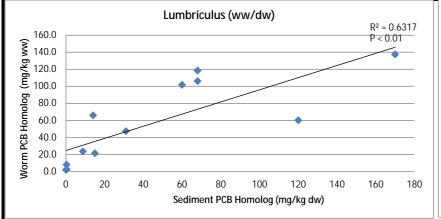
ANNISTON PCB SITE ANNISTON , ALABAMA

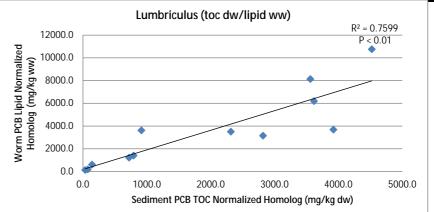
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

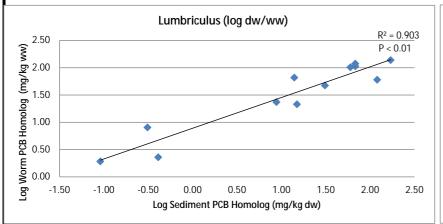
MERCURY - BENTHIC INVERTEBRATE - REGRESSION ANALYSIS

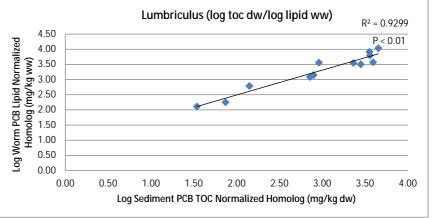


6/4/2013
G:\AProject\Anniston\OU-1\_OU-2 SERA\Post Agency Review drafts\Final drafts\Figure A-16\_060413\_v2\_jz.xlsxA-16









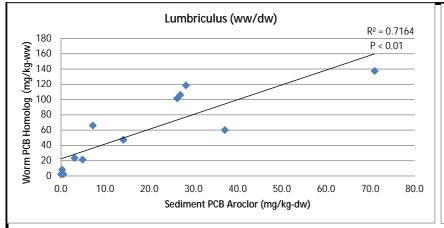
ANNISTON PCB SITE ANNISTON , ALABAMA

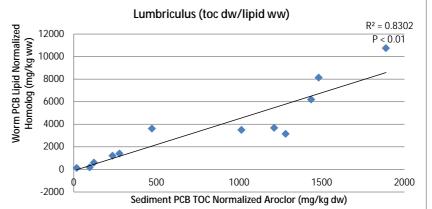
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

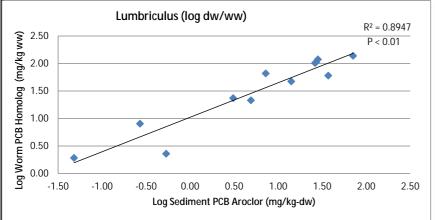
PCB – REGRESSION ANALYSIS OF LABORATORY BIOACCUMULATION DATA (SEDIMENT AND TISSUE MEASURED AS HOMOLOGUES)

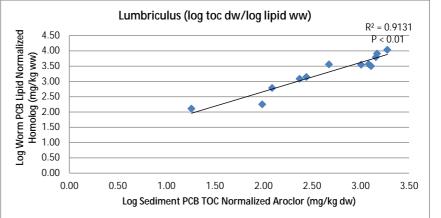


6/4/2013
G:\AProject\Anniston\OU-1\_OU-2 SERA\Post Agency Review drafts\Final drafts\Figure A-17\_060413\_v2\_jz.xlsxA-17







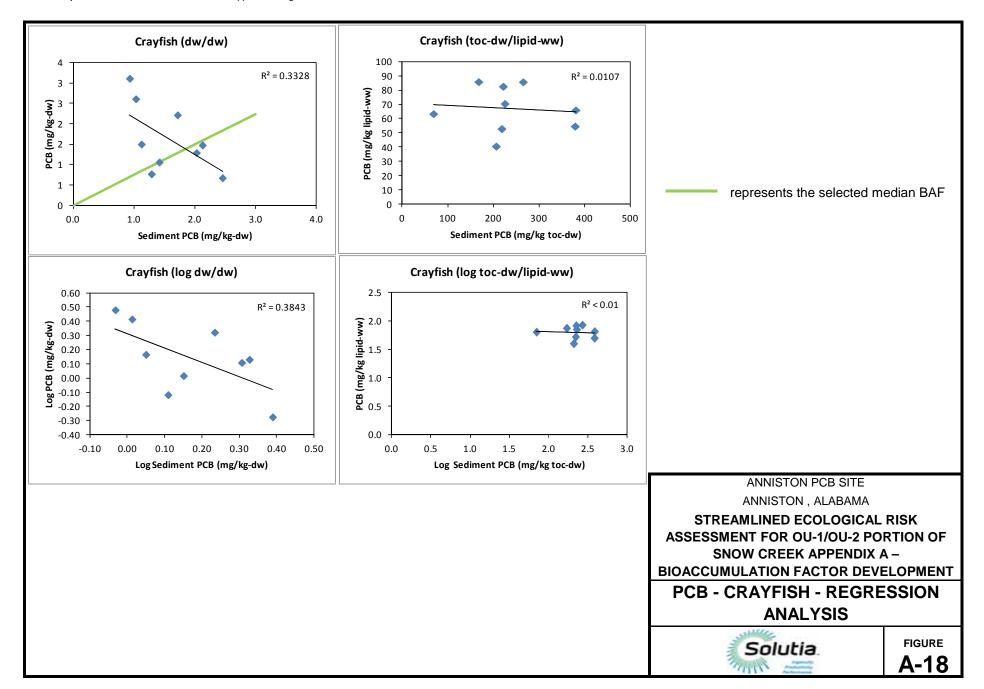


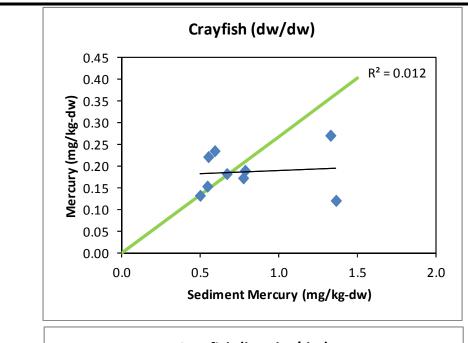
ANNISTON PCB SITE ANNISTON , ALABAMA

STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

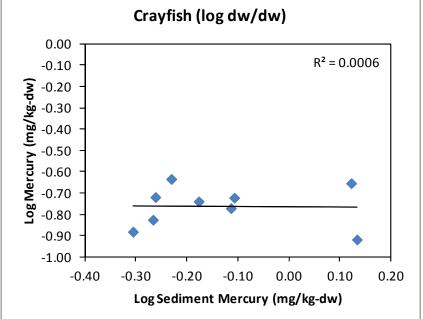
PCB – REGRESSION ANALYSIS OF LABORATORY BIOACCUMULATION DATA (SEDIMENT MEASURED AS AROCLORS AND TISSUE AS HOMOLOGUES)









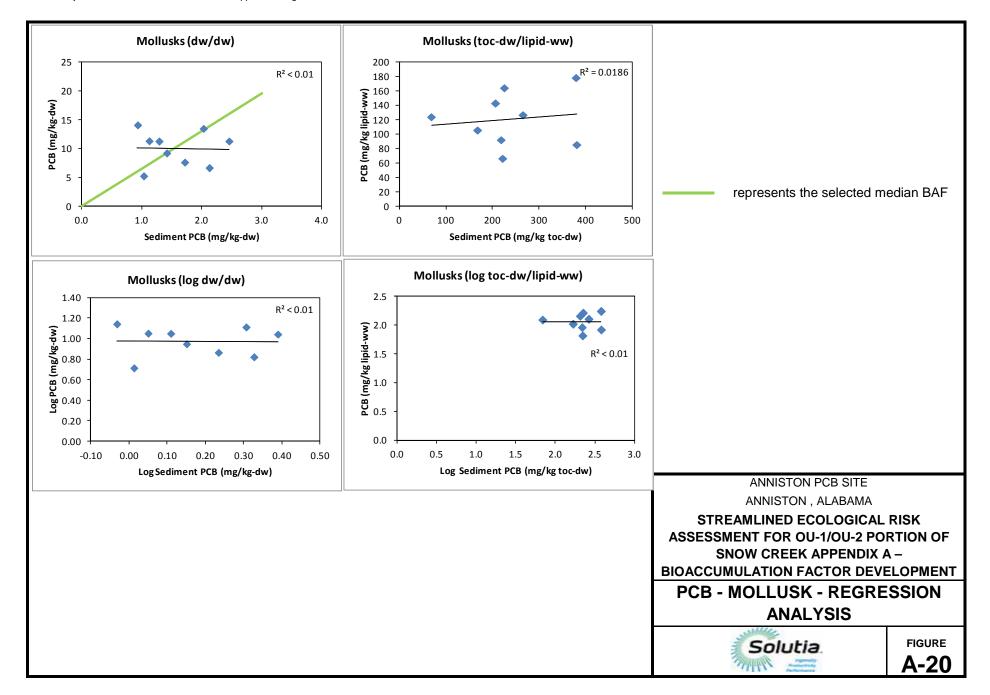


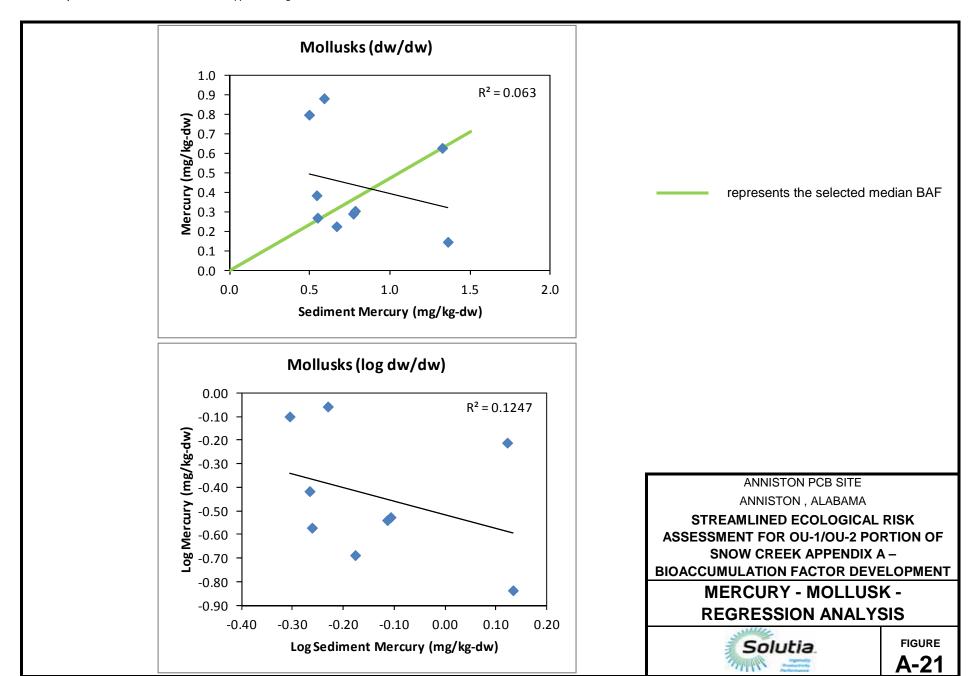
ANNISTON PCB SITE ANNISTON , ALABAMA

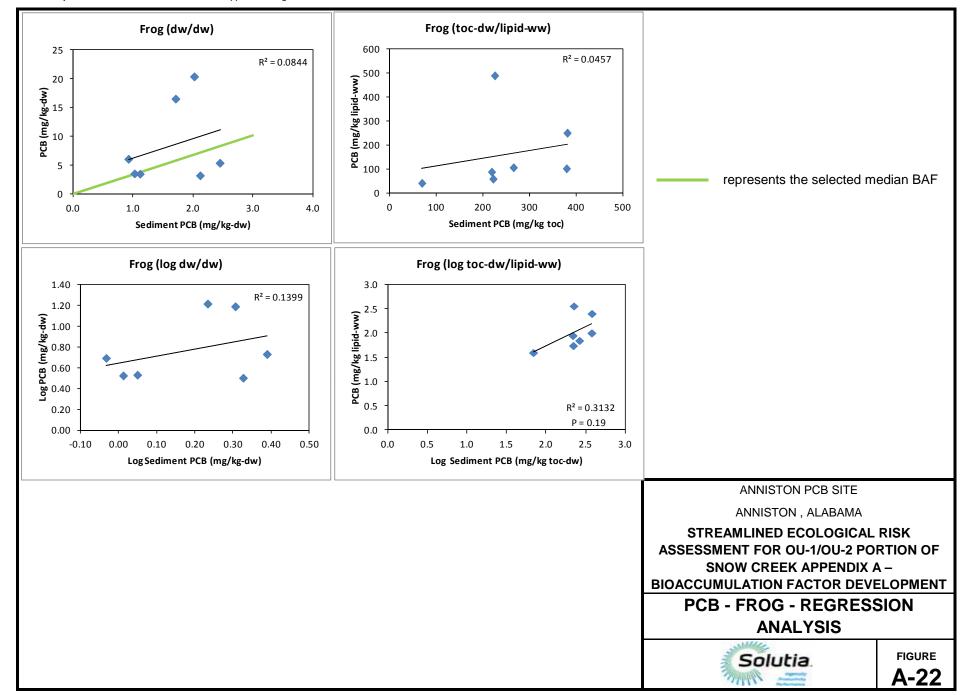
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

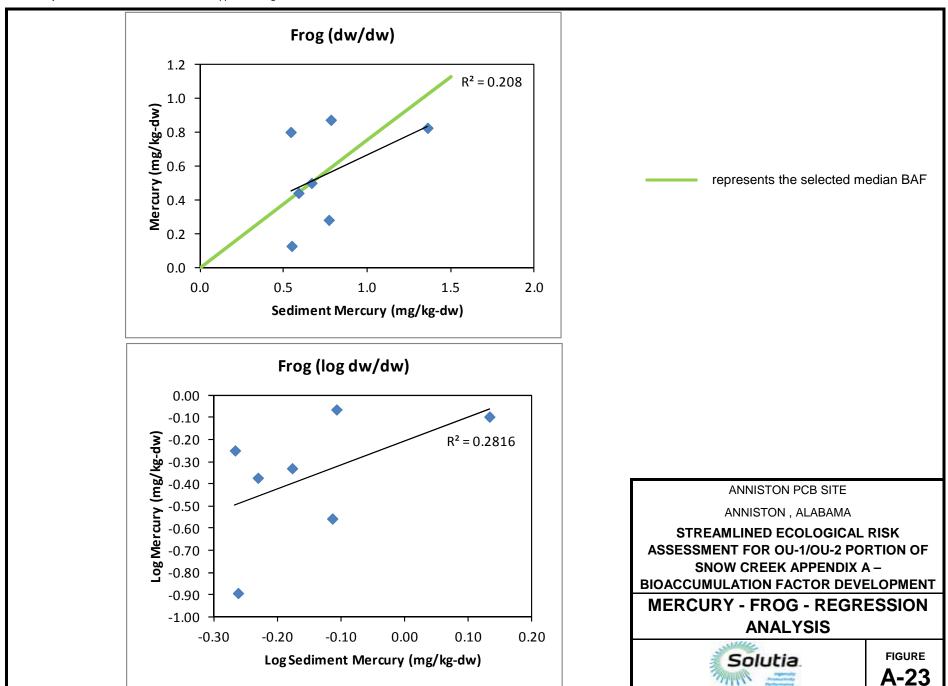
MERCURY - CRAYFISH - REGRESSION ANALYSIS



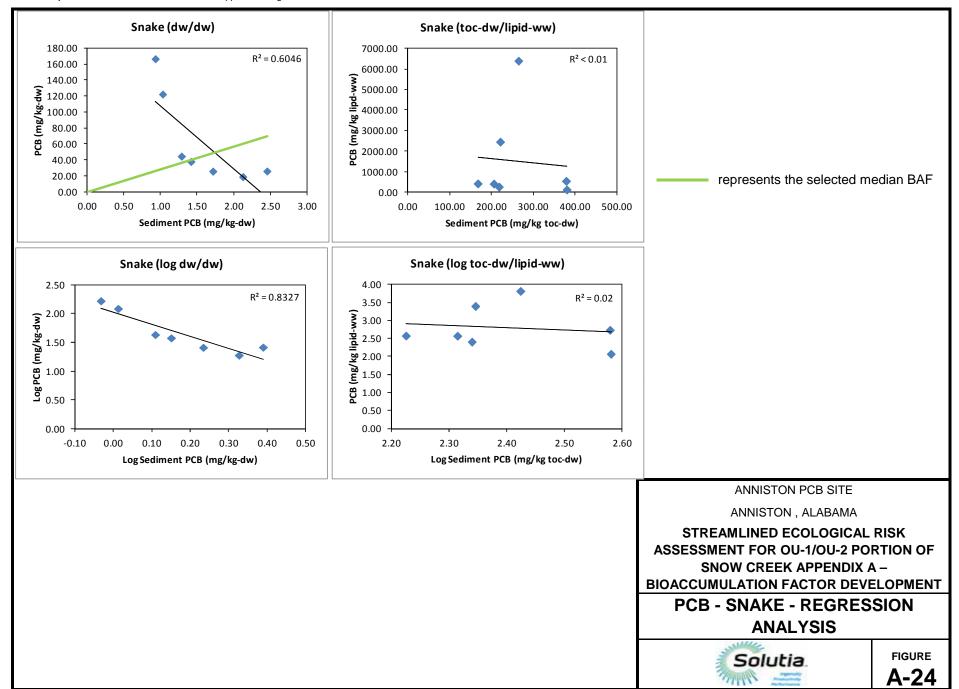


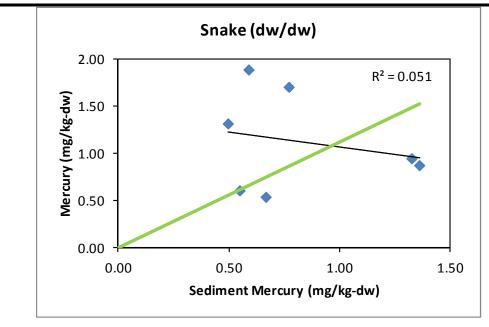


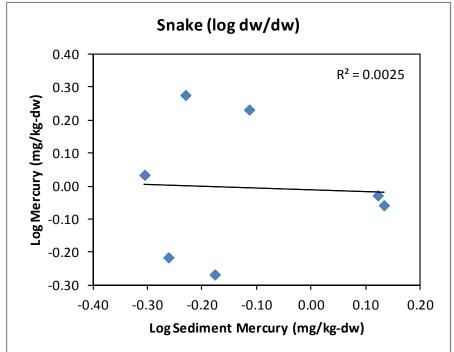




6/5/2013
G:\AProjects\Anniston 2013\OU-1 OU-2 SERA\Appendix A\Figure A-24.xlsxA-24







ANNISTON PCB SITE

ANNISTON, ALABAMA

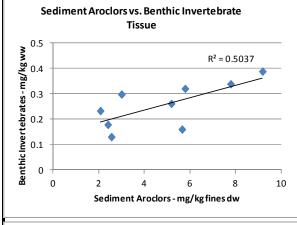
STREAMLINED ECOLOGICAL RISK ASSESSMENT FOR OU-1/OU-2 PORTION OF **SNOW CREEK APPENDIX A -BIOACCUMULATION FACTOR DEVELOPMENT** 

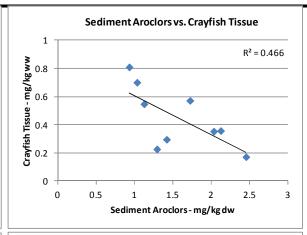
**MERCURY - SNAKE - REGRESSION ANALYSIS** 

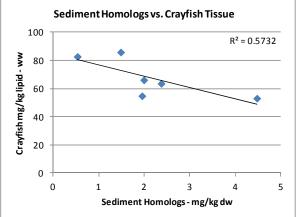


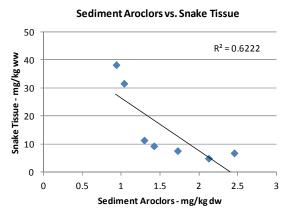
**FIGURE** 

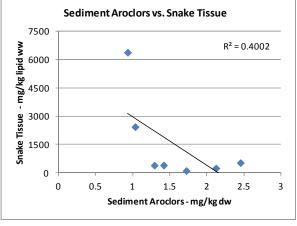
**A-25** 

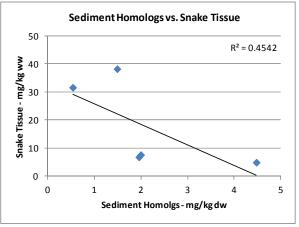


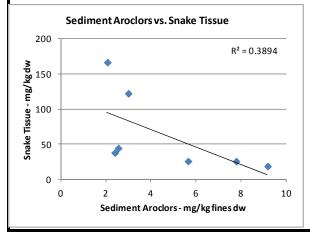












ww - wet weight dw - dry wieight PCB - polychlorinated biphenyl mg/kg - milograms per kilogram \*When both wet ww and dw tissue correlations had r2 values > 0.3, only the higher correlation plotted. ANNISTON PCB SITE

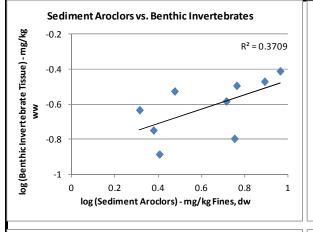
ANNISTON, ALABAMA

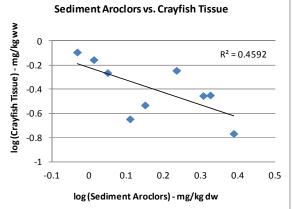
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

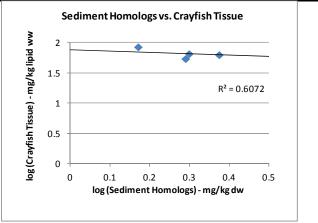
REGRESSION PLOTS OF SEDIMENT PCB AND TISSUE PCB CORRELATIONS WITH R2 VALUES >0.3\*

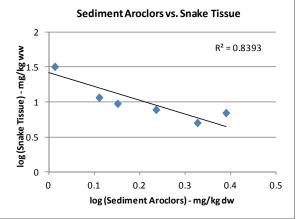


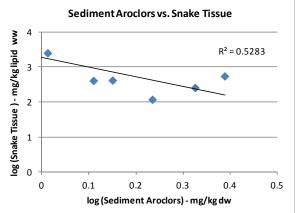
FIGURE

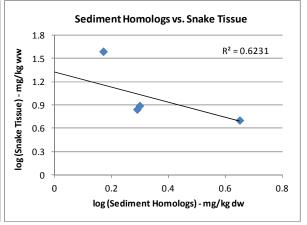


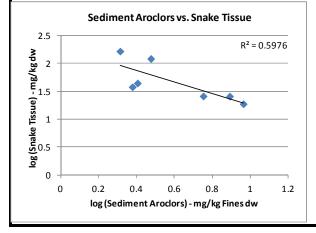












ww - wet weight dw - dry wieight PCB - polychlorinated biphenyl mg/kg - milograms per kilogram \*When both wet ww and dw tissue correlations had r2 values > 0.3, only the higher correlation plotted. ANNISTON PCB SITE

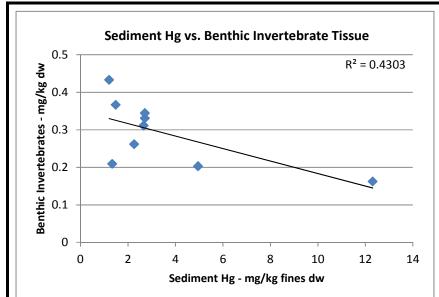
ANNISTON, ALABAMA

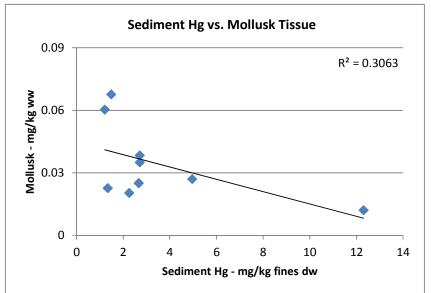
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

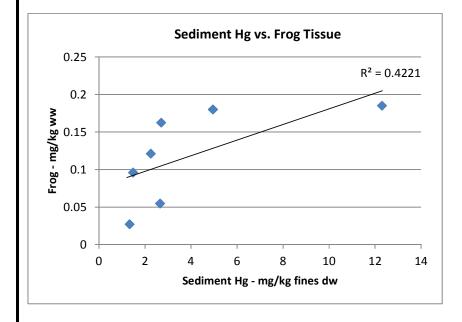
REGRESSION PLOTS OF LOG SEDIMENT PCB AND TISSUE PCB CORRELATIONS WITH R2 VALUES > 0.3\*



FIGURE A\_27







ww - wet weight dw - dry wieight Hg - mercury mg/kg - milograms per kilogram \*When both wet ww and dw tissue correlations had r2 values > 0.3, only the higher correlation plotted.

ANNISTON PCB SITE

ANNISTON, ALABAMA

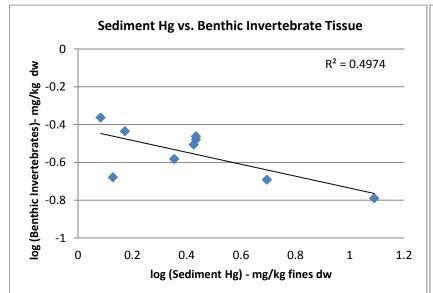
STREAMLINED ECOLOGICAL RISK
ASSESSMENT FOR OU-1/OU-2 PORTION OF
SNOW CREEK APPENDIX A –
BIOACCUMULATION FACTOR DEVELOPMENT

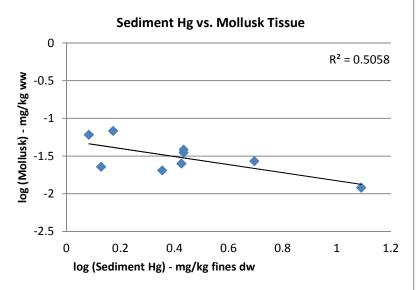
REGRESSION PLOTS OF SEDIMENT MERCURY AND TISSUE MERCURY CORRELATIONS WITH R2 VALUES > 0.3\*

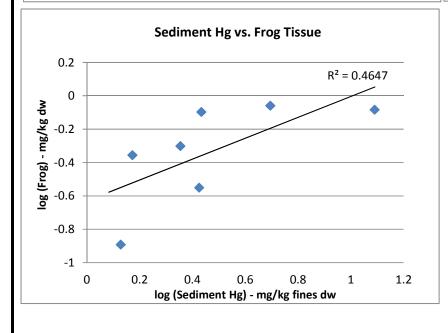


FIGURE

A-28







ww - wet weight dw - dry wieight Ha - mercury mg/kg - milograms per kilogram \*When both ww and dw correlations had  $r^2 > 0.3$ , the higher correlation was plotted

ANNISTON PCB SITE

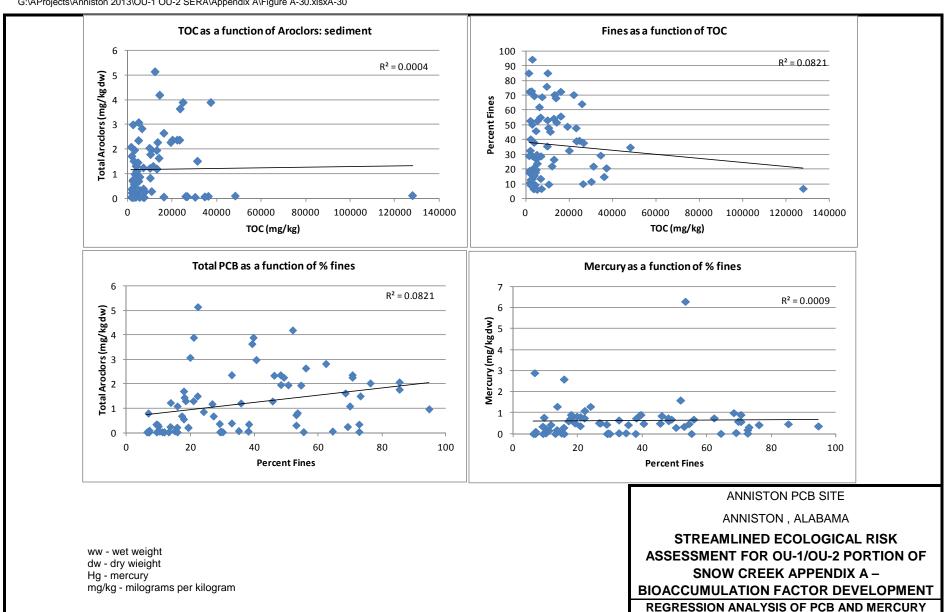
ANNISTON, ALABAMA

STREAMLINED ECOLOGICAL RISK ASSESSMENT FOR OU-1/OU-2 PORTION OF **SNOW CREEK APPENDIX A -BIOACCUMULATION FACTOR DEVELOPMENT** 

REGRESSION PLOTS OF LOG SEDIMENT MERCURY AND TISSUE MERCURY CORRELATIONS WITH R2 VALUES > 0.3°



**FIGURE** 



Solutia

CONCENTRATIONS AND PERCENT FINES; TOTAL ORGANIC CARBON AND PERCENT FINES

FIGURE



# Attachment A

Statistical Evaluation of Regression Analyses

# Attachment A

# **Regression Statistics**

- Table 1a: PCB Lumbriculus and Sediment Homolog Regression Statistical Summary Output (dw/dw basis)
- Table 1b: PCB Lumbriculus and Sediment Homolog Regression Statistical Summary Output (lipid/toc basis)
- Table 1c: PCB Lumbriculus and Sediment Aroclor and Homolog Regression Statistical Summary Output (dw/dw)
- Table 1d: PCB Lumbriculus and Sediment Aroclor and Homolog Regression Statistical Summary Output (lipid/toc)
- Table 2a: PCB Frog and Sediment Regression Statistical Summary Output (log lipid/toc basis)
- Table 3a. PCB Benthic Invertebrates vs. Aroclor in Sediment Normalized by Fines (dw/dw basis)
- Table 3b. PCB Benthic Invertebrates vs. Aroclor in Sediment Normalized by Fines (ww/dw basis)
- Table 3c. PCB Log Benthic Invertebrates vs. Log Aroclor in Sediment Normalized by Fines (ww/dw basis)
- Table 3d. PCB Log Benthic Invertebrates Normalized by Lipids vs. Log Sediment Homologs (ww/dw basis)
- Table 4a. Mercury Frog vs. Sediment Normalized by Fines (dw/dw basis)
- Table 4b. Mercury Frog vs. Sediment Normalized by Fines (ww/dw basis)
- Table 4c. Mercury Log Frog vs. Log Sediment Normalized by Fines (dw/dw basis)
- Table 4d. Mercury Log frog vs. Log Sediment Normalized by Fines (ww/dw basis)

# Table 1a - *Lumbriculous* and Sediment Homolog Regression Statistical Summary Output Evaluation based on Laboratory Replicate Mean PCB Concentrations

(Sediment and tissue measured as homolog groups)

# Dry weight/Dry weight basis

**SUMMARY OUTPUT** 

Regression Statistics					
Multiple R	0.794764916				
R Square	0.631651272				
Adjusted R Square	0.594816399				
Standard Error	30.7026748				
Observations	12				

### **ANOVA**

	df	SS	MS	F	Significance F
Regression	1	16164.81078	16164.811	17.14819	0.002008512
Residual	10	9426.542399	942.65424		
Total	11	25591.35318			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	24.80278975	11.91380351	2.0818532	0.063998	-1.742818619	51.3484
X Variable 1	0.712048935	0.17194943	4.1410369	0.002009	0.32892173	1.095176

# Log dry weight/log dry weight basis

**SUMMARY OUTPUT** 

Regression Statistics					
Multiple R	0.950288913				
R Square	0.903049018				
Adjusted R Square	0.893353919				
Standard Error	0.212480294				
Observations	12				

	df	SS	MS	F	Significance F
Regression	1	4.205294625	4.2052946	93.14491	2.19882E-06
Residual	10	0.451478754	0.0451479		
Total	11	4.656773379			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.890654383	0.086542243	10.291557	1.22E-06	0.697826251	1.083483
X Variable 1	0.562271653	0.058259484	9.6511609	2.2E-06	0.432461433	0.692082

# Table 1b - *Lumbriculous* and Sediment Homolog Regression Statistical Summary Output Evaluation based on Laboratory Replicate Mean PCB Concentrations

(Sediment and tissue measured as homolog groups)

# Lipid normal/organic carbon normalized basis

**SUMMARY OUTPUT** 

Regression Statistics					
Multiple R	0.871697698				
R Square	0.759856877				
Adjusted R Square	0.735842565				
Standard Error	1710.031769				
Observations	12				

### **ANOVA**

	df	SS	MS	F	Significance F
Regression	1	92527324.1	92527324	31.64183	0.000219897
Residual	10	29242086.52	2924208.7		
Total	11	121769410.6			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	178.6530326	775.7564163	0.2302953	0.822505	-1549.839971	1907.146
X Variable 1	1.723789259	0.30644557	5.6251074	0.00022	1.040985981	2.406593

# Log lipid normal/log organic carbon normal basis

**SUMMARY OUTPUT** 

Regression Statistics						
Multiple R	0.96513248					
R Square	0.931480703					
Adjusted R Square	0.924628773					
Standard Error	0.17050155					
Observations	12					

	df	SS	MS	F	Significance F
Regression	1	3.952006303	3.9520063	135.9443	3.8278E-07
Residual	10	0.290707787	0.0290708		
Total	11	4.24271409			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.85010336	0.213497115	3.9818026	0.002593	0.374402146	1.325805
X Variable 1	0.819949012	0.070324453	11.659515	3.83E-07	0.663256366	0.976642

# Table 1c - *Lumbriculous* and Sediment Aroclor and Homolog Regression Statistical Summary Output (dw/dw) Evaluation based on Laboratory Replicate Mean PCB Concentrations

(Sediment measured as Aroclors and tissue measured as homolog groups)

### Dry weight/Dry weight basis

SUMMARY OUTPUT

Regression Statistics						
Multiple R	0.846420972					
R Square	0.716428462					
Adjusted R Square	0.688071308					
Standard Error	26.93878132					
Observations	12					

### ANOVA

	df	SS	MS	F	Significance F
Regression	1	18334.37379	18334.37	25.26447	0.00051687
Residual	10	7256.979392	725.6979		
Total	11	25591.35318			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	22.31447156	10.49933043	2.125323	0.059488	-1.0794944	45.70843752
X Variable 1	1.935215026	0.385011881	5.026377	0.000517	1.0773551	2.793074953

## Log dry weight/log dry weight basis

SUMMARY OUTPUT

Regression Statistics					
Multiple R	0.94589203				
R Square	0.894711732				
Adjusted R Square	0.884182905				
Standard Error	0.221428003				
Observations	12				

	df		SS	MS	F	Significance F
Regression		1	4.166469775	4.16647	84.97734	3.3341E-06
Residual		10	0.490303603	0.04903		
Total		11	4.656773379			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	1.022412578	0.08092262	12.63445	1.8E-07	0.84210575	1.202719411
X Variable 1	0.627238831	0.068042672	9.218316	3.33E-06	0.47563031	0.778847351

# Table 1d - *Lumbriculous* and Sediment Arochlor and Homolog Regression Statistical Summary Output (lipid/toc) Evaluation based on Laboratory Replicate Mean PCB Concentrations

(Sediment measured as Aroclors and tissue measured as homolog groups)

## Lipid normal/organic carbon normalized basis

SUMMARY OUTPUT

Regression S	Statistics
Multiple R	0.911147767
R Square	0.830190253
Adjusted R Square	0.813209278
Standard Error	1437.971933
Observations	12

### ANOVA

	df	SS	MS	F	Significance F
Regression	1	101091777.8	1.01E+08	48.88943	3.7512E-05
Residual	10	20677632.79	2067763		
Total	11	121769410.6			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-116.399667	668.2071766	-0.1742	0.865187	-1605.25803	1372.458698
X Variable 1	4.605939298	0.658734944	6.992098	3.75E-05	3.13818638	6.073692214

## Log lipid normal/log organic carbon normal basis

SUMMARY OUTPUT

Regression Statistics					
Multiple R	0.955554558				
R Square	0.913084513				
Adjusted R Square	0.904392965				
Standard Error	0.192030612				
Observations	12				

_					Significance F
Regression	1	3.87395653	3.873957	105.0543	1.2675E-06
Residual	10	0.36875756	0.036876		
Total	11	4.24271409			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.757905058	0.251503858	3.013493	0.01304	0.19751954	1.318290574
X Variable 1	0.9540822	0.093084825	10.2496	1.27E-06	0.74667629	1.161488115

# Table 2a. PCB - Frog and Sediment Regression Statistical Summary Output (lipid/toc basis) Log lipid normal/log ocrganic carbon normal basis

SUMMARY OUTPUT

Regression Statistics								
Multiple R	0.559635818							
R Square	0.313192249							
Adjusted R Square	0.175830699							
Standard Error	0.316117144							
Observations	7							

	df	SS	MS	F	Significance F
Regression	1	0.22784627	0.227846	2.280058	0.191432191
Residual	5	0.499650245	0.09993		
Total	6	0.727496515			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.166365658	1.22591293	0.135708	0.897347	-2.984943852	3.317675167	-2.984943852	3.317675167
X Variable 1	0.783289794	0.518739784	1.509986	0.191432	-0.550173272	2.116752861	-0.550173272	2.116752861

Table 3a. PCB - Benthic Invertebrates (dw) vs. Aroclor in Sediment Normalized by Fines SUMMARY OUTPUT

Regression Statistics									
0.573585379									
0.329000187									
0.23314307									
0.361152091									
9									

	df		SS	MS	F	Significance F
Regression	•	1	0.447663877	0.4477	3.4322	0.106357685
Residual	7	7	0.913015828	0.1304		
Total	8	8	1.360679705			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.965886481	0.268841524	3.5928	0.0088	0.330177293	1.601595668	0.330177293	1.601595668
X Variable 1	0.09248369	0.049920538	1.8526	0.1064	-0.025559625	0.210527004	-0.025559625	0.210527004

## Table 3b. PCB - Benthic Invertebrates (ww) vs. Aroclor in Sediment Normalized by Fines SUMMARY OUTPUT

Regression Statistics								
Multiple R	0.713048528							
R Square	0.508438203							
Adjusted R Square	0.438215089							
Standard Error	0.065923378							
Observations	9							

	df		SS	MS	F	Significance F
Regression		1	0.031465671	0.0315	7.2403	0.031050417
Residual		7	0.030421242	0.0043		
Total		8	0.061886914			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.138117758	0.049073346	2.8145	0.026	0.022077734	0.254157781	0.022077734	0.254157781
X Variable 1	0.024519275	0.009112312	2.6908	0.0311	0.002972081	0.046066469	0.002972081	0.046066469

Table 3c. PCB - Log Benthic Invertebrates [ww] vs. Log Aroclor in Sediment Normalized by Fines SUMMARY OUTPUT

Regression Statistics									
Multiple R	0.608978558								
R Square	0.370854884								
Adjusted R Square	0.28097701								
Standard Error	0.137624052								
Observations	9								

	df	SS	MS	F	Significance F
Regression	1	0.078151963	0.07815	4.126208917	0.081754928
Residual	7	0.132582658	0.01894		
Total	8	0.210734621			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.876499793	0.13581242	-6.4538	0.000349027	-1.197645135	-0.55535445	-1.197645135	-0.55535445
X Variable 1	0.413727786	0.203675637	2.03131	0.081754928	-0.067888564	0.895344136	-0.067888564	0.895344136

## Table 3d. PCB - Log Benthic Invertebrates Normalized by Lipids [ww] vs. Log Sediment Homologs SUMMARY OUTPUT

Regression Statistics								
Multiple R	0.567211986							
R Square	0.321729437							
Adjusted R Square	0.152161796							
Standard Error	0.110367385							
Observations	6							

	df	SS	MS	F	Significance F
Regression	1	0.023111564	0.02311	1.897351616	0.240426417
Residual	4	0.048723839	0.01218		
Total	5	0.071835402			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.338994519	0.060801649	22.0223	2.51623E-05	1.170182078	1.507806961	1.170182078	1.507806961
X Variable 1	0.223563289	0.162303012	1.37744	0.240426417	-0.227062114	0.674188691	-0.227062114	0.674188691

**Table 4a. Mercury - Frog [dw] vs. Sediment Normalized by Fines** SUMMARY OUTPUT

Regression Statistics								
Multiple R	0.593770041							
R Square	0.352562862							
Adjusted R Square	0.223075434							
Standard Error	0.255963223							
Observations	7							

	df	SS	MS	F	Significance F
Regression	1	0.178387369	0.1784	2.7228	0.159839688
Residual	5	0.327585859	0.0655		
Total	6	0.505973228			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.373656863	0.143929261	2.5961	0.0485	0.003674919	0.743638808	0.003674919	0.743638808
X Variable 1	0.044833227	0.027170368	1.6501	0.1598	-0.025010428	0.114676882	-0.025010428	0.114676882

## **Table 4b. Mercury - Frog [ww] vs. Sediment Normalized by Fines** SUMMARY OUTPUT

Regression Statistics								
Multiple R	0.636095773							
R Square	0.404617832							
Adjusted R Square	0.285541399							
Standard Error	0.052452113							
Observations	7							

	df		SS	MS	F	Significance F
Regression		1	0.00934857	0.0093	3.398	0.124608408
Residual		5	0.013756121	0.0028		
Total	1	6	0.02310469			
	· ·		•			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.07772225	0.029494057	2.6352	0.0462	0.001905363	0.153539137	0.001905363	0.153539137
X Variable 1	0.010263383	0.005567766	1.8434	0.1246	-0.004049014	0.02457578	-0.004049014	0.02457578

**Table 4c. Mercury - Log Frog [dw] vs. Log Sediment Normalized by Fines** SUMMARY OUTPUT

Regression Statistics									
Multiple R	0.679908902								
R Square	0.462276115								
Adjusted R Square	0.354731338								
Standard Error	0.244109484								
Observations	7								

	df		SS	MS	F	Significance F
Regression		1	0.256142378	0.25614	4.29845	0.092852674
Residual		5	0.297947201	0.05959		
Total		6	0.55408958			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.634142476	0.171548825	-3.69657	0.01405	-1.075122769	-0.19316218	-1.0751228	-0.193162183
X Variable 1	0.637858195	0.307657902	2.07327	0.09285	-0.153001619	1.42871801	-0.1530016	1.42871801

**Table 4d. Mercury - Log Frog [ww] vs. Log Sediment Normalized by Fines** SUMMARY OUTPUT

Regression Statistics										
Multiple R	0.67515444									
R Square	0.45583352									
Adjusted R Square	0.34700022									
Standard Error	0.25138417									
Observations	7									

	df		SS	MS	F	Significance F
Regression	•	1	0.26467951	0.2647	4.1884	0.096064015
Residual	Į.	5	0.315970001	0.0632		
Total	(	ŝ	0.580649511			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.309706	0.176661135	-7.4137	0.0007	-1.763827883	-0.8555841	-1.763828	-0.85558407
X Variable 1	0.64840086	0.316826387	2.0465	0.0961	-0.166027295	1.462829	-0.166027	1.462829015



Analysis of OU-4 Sediment Toxicity
Test Results and Development of
Site-Specific Risk-Based
Concentrations for PCBs in Sediment



Pharmacia LLC and Solutia Inc.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek

Appendix B: Analysis of OU-4
Sediment Toxicity Test Results
and Development of SiteSpecific Risk-Based
Concentrations for PCBs in
Sediment

Anniston PCB Site, Anniston, Alabama

December 2013 Revision 2

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Table B-7

Results of toxicity tests with *Chironomus dilutus* exposed to OU-4 sediments from the Anniston PCB Site, Anniston, Alabama. Responses in OU-4 sediments are expressed as a percentage of the lowest response recorded among the six reference sediments (i.e., bottom-of-reference-envelope response), after all OU-4 and reference sediments had first been normalized to the control response within the batch in which they were tested.

Table B-8 Results of toxicity tests with *Hyalella azteca* exposed to OU-4 sediments from the Anniston PCB Site, Anniston, Alabama. Responses in OU-4 sediments are expressed as a percentage of the lowest response recorded among the six reference sediments (i.e., bottom-of-reference-envelope response), after all OU-4 and reference sediments had first been normalized to the control response within the batch in which they were tested.

#### **Figures**

Figure B-1. Relationship between total PCB homolog (tPCBH) and total PCB Aroclor (tPCBA) concentrations in OU 4 sediments collected for toxicity testing. (a) All the sediments; the least-squares regression fit (the diagonal line) is tPCBH = 2.154×tPCBA + 7.363. (b) Only the 7 sediments having <4 mg tPCBA/kg dw sediment; the diagonal lines show homolog:Aroclor ratios of 2:1 and 1:1 for illustrative purposes.

Figure B-2. Response vs. dry weight-normalized tPCBA concentration relationships in the Chironomus dilutus toxicity tests conducted with OU-4 sediments from the Anniston PCB Site. Curves are logistic regressions; where no curve is shown, the response variable did not decrease as tPCBA concentration decreased. AFDW = ash-free dry weight; USACE = U.S. Army Corps of Engineers; USGS = U.S. Geological Survey.

Figure B-3. Response vs. dry weight-normalized tPCBA concentration relationships in the Hyalella azteca toxicity tests conducted with OU-4 sediments from the Anniston PCB Site. Curves are logistic regressions; where no curve is shown, the response variable did not decrease as tPCBA concentration decreased. AFDW = ash-free dry weight; USACE = U.S. Army Corps of Engineers; USGS = U.S. Geological Survey.

#### **Acronyms and Abbreviations**

°C degrees Celsius

COPC constituent of potential concern

d day

dw dry weight kg kilogram(s)

OC organic carbon
OU Operable Unit

PAH polycyclic aromatic hydrocarbon





PCB polychlorinated biphenyl

PEC probable effect concentration

TOC total organic carbon

tPCB total polychlorinated biphenyl

tPCB<sub>A</sub> total polychlorinated biphenyl Aroclor
tPCB<sub>H</sub> total polychlorinated biphenyl homolog

USACE-ERDC U.S. Army Corps of Engineers' Engineer Research and Development Center

USEPA U.S. Environmental Protection Agency

USGS-CERC U.S. Geologic Survey's Columbia Environmental Research Center



Analysis of OU-4 Sediment Toxicity Test Results and Development of Site-Specific Risk-Based Concentrations for PCBs in Sediment

#### 1. Introduction

As part of a baseline ecological risk assessment to be prepared for Operable Unit 4 (OU-4) of the Anniston Polychlorinated Biphenyl (PCB) Site, sediment toxicity tests were conducted to provide information about the site-specific effects of PCBs in OU-4 sediments to benthic macroinvertebrates. This appendix reports the results of those tests, which are used to develop Site-Specific Risk-Based Concentrations for PCBs that are protective of the benthic invertebrate community that may be present in OU-1/OU-2 sediments.

#### 2. Methods

#### 2.1 Overview

The objective of this study was to develop concentration-response relationships for prediction of chronic toxicity to benthic invertebrates in OU-4 sediments that might be caused by PCBs and other constituents of potential concern (COPCs). Therefore, candidate sediments were selected to span a wide range of combinations of total PCB (tPCB) and organic carbon (OC) concentrations, instead of randomly sampling the OU-4 sediments. The six targeted bins of OC-normalized PCB concentrations (expressed as milligrams of tPCB per kilogram OC [mg tPCB/kg OC]) were: <100; 100 to 500; 501 to 1,000; 1,001 to 5,000; 5,001 to 10,000; and >10,000. In an attempt to test multiple sediments within each concentration bin, a total of 32 sediments were collected from: (1) various depths at six OU-4 locations (26 sediments), and (2) a reference location (six sediment samples; on Choccolocco Creek approximately 3 kilometers upstream of the site). The higher tPCB-concentration samples were collected from a backwater area near the confluence of Snow and Choccolocco Creeks that had stable sediments and is the only place in OU-4 that contains such high concentrations. Because the reference sediments were collected well upstream of the confluence with Snow Creek, they do not reflect the background signal of urban runoff and, therefore, from a site perspective, do not constitute true reference samples.

Specific details of the analyses and methods employed during the testing program and the sediment toxicity and laboratory bioaccumulation testing data are presented in draft form in Ingersoll et al (in review). The sediments were chemically characterized, and chronic toxicity tests were conducted with two benthic macroinvertebrates (*Chironomus dilutus* [a freshwater midge] and *Hyalella azteca* [a freshwater amphipod]) exposed to the sediments. A variety of survival, growth, and reproduction endpoints were monitored in the toxicity tests (Table B-1); and sigmoid concentration-response relationships between the endpoints and tPCB concentration in the sediment were fit to the data. Additionally, concentrations of non-PCB COPCs in the sediments were compared to screening-level concentrations to determine if additional variables should be added as predictors in the concentration-response relationships. Reference envelopes were calculated for each toxicity endpoint; and the sediment PCB concentrations associated with 10, 20, and 50 percent impairment beyond the lower limit of each reference envelope were calculated and compared to published "consensus-based" sediment quality guidelines.



Analysis of OU-4 Sediment Toxicity Test Results and Development of Site-Specific Risk-Based Concentrations for PCBs in Sediment

#### 2.2 Sediment Collection and Processing

All sediment samples were collected between August 18 and 23, 2010. At each sampling location, a Lexan<sup>®</sup> tube was hand-pushed into the sediment to the desired depth. Cores that did not remain intact were discarded, and the sediment depth was re-sampled. For each depth increment at each sample-collection location, a minimum of 16 liters of sediment was collected and composited in high-density polyethylene buckets. The composited samples were stored at 4 degrees Celsius (°C) until, within 24 hours of sampling, they were sieved through a 2-millimeter stainless-steel or brass sieve. The sediment that passed through the sieve ranged from 64 to 99 percent by weight of the total sediment sieved and was typically >75 percent by weight.

Sieved samples were then shipped under refrigeration to the U.S. Geological Survey's Columbia Environmental Research Center (USGS-CERC) in Columbia, Missouri, where they were stored at 4 °C in the dark. The sediments were homogenized and subsampled for initial analyses of PCB Aroclor and total organic carbon (TOC) concentrations, and preliminary 10-day (d) lethality tests were conducted with *H. azteca* at USGS-CERC. Results of the Aroclor and TOC analyses and the lethality tests were used to select sediment samples for subsequent rounds of chronic toxicity tests.

#### 2.3 Toxicity Tests

Because of the large number of sediments to be tested, the chronic toxicity tests were conducted in three separate batches during two different rounds of testing in two different labs (at the USGS-CERC, and at the U.S. Army Corps of Engineers' Engineer Research and Development Center [USACE-ERDC] in Vicksburg, Mississippi). Sediments to be tested at USACE-ERDC were transported there under refrigeration from USGS-CERC and were then stored at 4 °C in the dark.

The definitive chronic toxicity tests were conducted in two cycles (1a and 1b), which were started during the week of November 1, 2010, for Cycle 1a and during the week of January 17, 2011, for Cycle 1b. One control, one reference, and 10 site sediments (containing intermediate to high concentrations of tPCBs) were tested in Cycle 1a. In Cycle 1b, one control, the remaining five reference, and 10 additional site sediments (mostly containing low to intermediate concentrations of tPCBs) were tested. Because one sediment (#20) was tested in both Cycle 1a and Cycle 1b, 26 different sediment samples (20 site sediment samples and six reference sediment samples) were tested. The USGS-CERC laboratory conducted most of the *C. dilutus* toxicity tests, whereas the USACE-ERDC laboratory conducted most of the *H. azteca* toxicity tests. However, in Cycle 1a, the two labs conducted additional tests with *H. azteca* (at USGS-CERC) and *C. dilutus* (at USACE-ERDC) exposed to one control and five site sediment samples to allow inter-laboratory comparisons of toxicity results. At the end of Cycle 1b, USGS-CERC also conducted side-by-side sets of 20-d *C. dilutus* toxicity tests for one control and five site sediment samples that were started with 7-d-old larvae or <24-hour-old larvae, to compare relative sensitivity of the two life stages.



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Seven days before the start of a test, each sediment sample to be tested was removed from cold storage. re-homogenized, and placed into the exposure chambers along with overlying water. The exposure chambers were then kept at 23 °C for 7 days without renewal of the overlying water, to allow the sedimentwater system to equilibrate before organisms were placed in the chambers at the start of the test. All tests were conducted in basic accordance with ASTM International (2012) and U.S. Environmental Protection Agency (USEPA 2000) guidance. However, except in the life-stage-sensitivity tests conducted at the end of Cycle 1b, all C. dilutus tests were started with 7-d-old larvae instead of <24-hour-old larvae (the age specified in ASTM International 2012) to increase the probability of meeting control-survival acceptability and, thus, have acceptable test results. Twelve survival, growth, and reproduction endpoints were measured in the C. dilutus tests; and 11 survival, growth, and reproduction endpoints were measured in the H. azteca tests (Table B-1). Although six additional H. azteca endpoints were reported by the laboratories, those endpoints are not included in this analysis because they were: (1) 35-d survival and reproduction endpoints that did not provide additional discrimination beyond that provided by the 28-d and 42-d survival and reproduction endpoints, or (2) 28-d and 42-d dry weight (dw) per individual and biomass per replicate endpoints that were calculated from measured lengths of *H. azteca* (using generic length-weight regressions) and, thus, are not considered as reliable as the same endpoints based on dw measured during the toxicity tests (i.e., the 28-d and 42-d dw per individual and biomass per replicate endpoints listed in Table B-1). The test durations were 42 d for H. azteca and up to 54 d for C. dilutus.

#### 2.4 Chemical Analyses

Sub-samples of the sediments collected for toxicity testing were analyzed for six grain-size categories, moisture content, loss on ignition, concentrations of OC, 23 major and trace elements (including the 16 metals and metalloids on the USEPA Target Analyte List), acid volatile sulfide, five simultaneously extracted metals, nine PCB Aroclors, 13 PCB congeners, 10 PCB homolog groups, one biphenyl, 46 parent and alkylated polycyclic aromatic hydrocarbons (PAHs), 21 organochlorine pesticides, and 17 polychlorinated dibenzo-*p*-dioxins and furans congeners. Additionally, during the toxicity tests, porewaters (collected by centrifugation or by peepers placed approximately 1 centimeter into the sediment in the exposure chambers) were analyzed for pH; conductivity; alkalinity; hardness; and concentrations of ammonia, hydrogen sulfide, dissolved organic carbon, four inorganic anions, and 61 major and trace elements.

#### 2.5 Data Analyses

Because the definitive chronic toxicity tests for each species were conducted in three separate batches (at different times and/or in different labs) and the control responses sometimes differed considerably among those batches (Table B-2), the response measured for each endpoint for each species was normalized to the average response measured for that endpoint in the control sediment tested concurrently with that batch of sediments. Therefore, the response for each endpoint in each sediment sample was expressed as a



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percentage of the control response; and thus, control-normalized responses greater than 100 percent sometimes occurred in reference and/or site sediments.

After control normalization, each endpoint response was regressed against dry-weight-normalized tPCB Aroclor (tPCB<sub>A</sub>) concentration and separately against OC-normalized tPCB<sub>A</sub> concentration to develop two concentration-response relationships for each endpoint. The dry-weight-normalized and OC-normalized tPCB<sub>A</sub> concentrations were chosen as the predictors for the concentration-response relationships because sediments at the OU-4 site previously had been characterized in terms of their tPCB<sub>A</sub> concentrations instead of their tPCB homolog (tPCB<sub>H</sub>) concentrations; thus, necessitating development of toxicity-predictor equations based on tPCB<sub>A</sub> concentrations for use in remediation decisions. The concentration-response curves were calculated using nonlinear regression in SPSS 8.0.0 for Windows<sup>®</sup> (SPSS, Inc., Chicago, IL), by fitting the data to the following sigmoid logistic equation:

Equation 1: 
$$R = \frac{R_{\text{max}}}{1 + \left(\frac{tPCB_A}{EC50}\right)^{slope}}$$

Where:

R = response value (percent of control),

R<sub>max</sub> = regression-fitted maximum response (percent of control),

 $tPCB_A$  = total PCB Aroclor concentration (mg/kg dry sediment or mg/kg OC),

EC50 = 50 percent effect concentration of tPCB<sub>A</sub> (mg/kg dry sediment or mg/kg OC), and

slope = slope of the logistic regression of R vs. tPCB<sub>A</sub> concentration.

A reference envelope was calculated for each endpoint, using the control-normalized responses of the six reference sites; and the "bottom" of that response envelope was defined as the lowest control-normalized response percentage observed in the six reference sediment samples (except for time to emergence of *C. dilutus*, for which the highest control-normalized response percentage [i.e., the most delayed emergence from the pupal cocoon] represented the most adverse effect). That bottom-of-the-envelope response was defined as R0\* (i.e., a reference-sediment-adjusted zero response). Then, R10\*, R20\*, and R50\* (i.e., the reference-adjusted 10, 20, and 50 percent response percentages) were calculated by multiplying R0\* by 0.9, 0.8, and 0.5, respectively. For example, if the lowest control-normalized survival among the six reference sediments was 80 percent, R0\*, R10\*, R20\*, and R50\* would be 80, 72, 64, and 40 percent, respectively.



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The regression-predicted EC0\*, EC10\*, EC20\*, and EC50\* values (i.e., the dry-weight-normalized and OC-normalized tPCB<sub>A</sub> concentrations associated with the R0\*, R10\*, R20\*, or R50\* reference-sediment response percentages) were back-calculated by entering R0\*, R10\*, R20\*, or R50\* as R and the regression-specific values of  $R_{max}$ , slope, and EC50 into Equation 1, and then solving for tPCB<sub>A</sub>. The "bottom" of the response envelope was defined as the lowest response percentage instead of as the 5th percentile of the reference-sediment response percentages because only six reference sediments were tested, thus leaving high uncertainty about the true numerical value of the 5th percentile reference response.

#### 3. Results and Discussion

Results of chemical analyses of bulk sediments collected from OU-4 for the sediment-toxicity tests and of porewater and overlying water in the toxicity tests are reported in Ingersoll et al. (In review). Concentrations of metals, PAHs, and organochlorine pesticides were generally lower than "consensus-based" probable effect concentrations (PECs) published by MacDonald et al. (2000b). Therefore, those COPCs are not likely to have contributed significantly (relative to PCBs) to toxicity in OU-4 sediments, leaving PCBs as the likely dominant contaminant. Therefore, the remainder of this discussion about OU-4 sediment toxicity tests focuses only on PCBs.

When regressed across all the OU-4 sediments collected for toxicity testing, the  $tPCB_H$  concentration was approximately 2 times the  $tPCB_A$  concentration (Figure B-1a). That relationship was evident down to a concentration of approximately 0.6 mg  $tPCB_A/kg$  dw sediment; however, at concentrations less than 0.6 mg  $tPCB_A/kg$  dw sediment, the  $tPCB_H:tPCB_A$  ratio was approximately 1:1 (Figure B-1b).

The same laboratory-control sediment was used in all three batches of toxicity tests; however, responses of the test organisms to the laboratory-control sediment varied considerably for some toxicity-endpoint responses (Table B-2). The variation among the three control responses for each endpoint (expressed as 100%•[max{control response}] - min{control response}]/[mean{control response}]) ranged from 1.3 percent (42-d survival of *H. azteca*) to 137 percent (42-d young/female for *H. azteca*). In general, survival and hatch-percentage endpoints varied by relatively small percentages (1.3 to 4.4 percent), growth endpoints varied by intermediate percentages (18 to 80 percent), and reproduction endpoints varied by intermediate to large percentages (25 to 137 percent). Given the sometimes large variability in control responses for a toxicity endpoint, large variability can also be expected in responses of organisms exposed to OU-4 sediments. Therefore, to account for uncertainty associated with the sometimes intermediate to high variability in toxicity-test responses, the regression-predicted PCB concentration at the bottom of a reference envelope should not be used as a threshold for remediation decisions. Instead, a percentage response lower than the lowest response observed in control and reference sediments (e.g., 20 percent lower than the bottom of the reference envelope) should be used for defining a PCB concentration threshold for remediation decisions.



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As another indication of variability in the sediment-toxicity results, USGS-CERC conducted *C. dilutus* tests with Sediment #20 once in Cycle 1a and once in Cycle 1b (i.e., approximately 2½ months apart). The difference in control-normalized response for each endpoint (expressed as 100%•[absolute value {Cycle 1b response - Cycle 1a response}]/[mean{Cycle 1a and 1b responses}]) ranged from 0.2 percent (13-d biomass/replicate) to 74 percent (number of egg cases). Of the 12 endpoints, six (50 percent) had differences that were less than 20 percent of the mean control-normalized response, and five (42 percent) had differences between 20 and 50 percent of the mean control-normalized response (including a 27 percent difference in percent emergence, which was the most sensitive endpoint for *C. dilutus*). The median difference was 22.4 percent. Those differences between Cycle 1a and Cycle 1b results might have been caused by: (1) different sensitivity of the batches of *C. dilutus* tested approximately 2½ months apart, (2) chemical changes in Sediment #20 during storage between the two cycles of testing, or (3) random variability to be expected in sediment-toxicity tests. Regardless of the cause(s), these results also support not using the lowest response observed in control and reference sediments for defining a PCB concentration threshold for remediation decisions (e.g., instead using 20 percent lower than the bottom of the reference envelope for defining a PCB concentration threshold for remediation decisions).

Toxicity responses were similar when the same sediment was tested by both USGS-CERC and USACE-ERDC (with either *C. dilutus* or *H. azteca*) in the inter-laboratory comparison conducted during Cycle 1a (Ingersoll et al. In review). Therefore, there did not appear to be a substantial between-species-comparison bias caused by conducting most of the *C. dilutus* tests at USGS-CERC and most of the *H. azteca* tests at USACE-ERDC, or by combining results from both testing labs when constructing concentration-response relationships for either species.

In the side-by-side sets of 20-d *C. dilutus* toxicity that were started with 7-d-old larvae or <24-hour-old larvae, survival, weight, and biomass were relatively consistent between the two life stages (Ingersoll et al. In review). Therefore, tests started with 7-d-old larvae (i.e., all the results reported below for *C. dilutus*) did not appear to underestimate the toxicity of OU-4 sediments to *C. dilutus* compared to tests started with <24-hour-old larvae, and that deviation from standard protocol (ASTM International 2012) did not bias interpretations of the toxicity of OU-4 sediments.

A variety of concentration-response relationships were observed among the 23 total toxicity endpoints (Figures B-2 and B-3). Most of the *C. dilutus* and *H. azteca* endpoints had response vs. tPCB<sub>A</sub> concentration relationships in which survival, growth, or reproduction in most of the reference and OU-4 sediments was less than in the laboratory control sediment and decreased as tPCB<sub>A</sub> concentration increased (e.g., Figure B-2); however, for some endpoints, most of the reference sediments and some of the OU-4 sediments exceeded the control-sediment responses (e.g., Figure B-2). Moreover, responses for some endpoints remained approximately constant as tPCB<sub>A</sub> concentration increased (e.g., Figure B-3); and for a few endpoints, the response tended to increase as tPCB<sub>A</sub> concentration increased, contrary to traditional expectations (e.g., Figure B-3). Logistic regressions and EC0\*, EC10\*, EC20\*, and EC50\* values were only



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calculated when an endpoint response decreased as tPCB<sub>A</sub> concentration increased. Regression coefficients for the concentration-response curves are listed in Table B-3.

For H. azteca, the dry-weight-normalized EC0\*, EC10\*, and EC20\* values ranged from 1.38 to 31.0 mg tPCB<sub>A</sub>/kg dw sediment for EC0\* values, from 2.58 to 127 mg tPCB<sub>A</sub>/kg dw sediment for EC10\* values, and from 4.43 to 165 mg tPCB<sub>A</sub>/kg dw sediment for EC20\* values (Table B-1). The corresponding OC-normalized EC0\*, EC10\*, and EC20\* values ranged from 72.8 to 2,380 mg tPCB<sub>A</sub>/kg OC for EC0\* values, from 120 to 5,250 mg tPCB<sub>A</sub>/kg OC for EC10\* values, and from 195 to 7,600 mg tPCB<sub>A</sub>/kg OC for EC20\* values (Table B-1). The most sensitive endpoint in the H. azteca tests was 42-d young/female normalized to 42-d survival of the adult females, for which the EC0\*, EC10\*, and EC20\* values were 1.38, 2.58, and 4.43 mg tPCB<sub>A</sub>/kg dw sediment (72.8, 120, and 195 mg tPCB<sub>A</sub>/kg OC; Table B-1 and Figure B-3).

For C. dilutus, the dry-weight-normalized EC0\*, EC10\*, and EC20\* values ranged from 0.43 to 209 mg tPCB<sub>△</sub>/kg dw sediment for EC0\* values, from 1.19 to 260 mg tPCB<sub>△</sub>/kg dw sediment for EC10\* values, and from 2.54 to 324 mg tPCB<sub>A</sub>/kg dw sediment for EC20\* values (Table B-1). The corresponding OCnormalized EC0\*, EC10\*, and EC20\* values ranged from 58.2 to 8,390 mg tPCB<sub>△</sub>/kg OC for EC0\* values, from 131 to 9,890 for EC10\* values, and from 241 to 13,900 mg tPCB<sub>△</sub>/kg OC for EC20\* values (Table B-1). The most sensitive endpoint in the C. dilutus tests was adult biomass per replicate chamber, for which the EC0\*, EC10\*, and EC20\* values were 0.43, 1.19, and 2.54 mg tPCB<sub>A</sub>/kg dw sediment (58.2, 131, and 241 mg tPCB<sub>△</sub>/kg OC: Table B-1 and Figure B-2). However, that adult-biomass endpoint has high uncertainty associated with it. It was estimated by the testing laboratories by calculating adult emergence × 13-d ashfree dry weight, with an explicit assumption that the ratio of adult ash-free dry weight (not measured during the toxicity tests) to the 13-d ash-free dry weight (which was measured) was constant for all the control, reference, and OU-4 sediments. That assumption cannot be verified, thus leaving that adult-biomass endpoint highly uncertain. Therefore, remediation goals for OU-4 should not be based on estimated adult biomass. The next most-sensitive C. dilutus endpoint was emergence percentage, for which the dry-weightnormalized EC0\*, EC10\*, and EC20\* values were 2.04, 6.80, and 14.3 mg tPCB<sub>A</sub>/kg dw sediment (170, 465, and 873 mg tPCB<sub>A</sub>/kg OC; Table B-1 and Figure B-2).

The results described above are based on an approach in which all laboratory results were treated independently (i.e., results for same sediments tested at two different labs were treated as independent). To evaluate possible uncertainty associated with this approach, an additional analysis comparing the nonlinear-regression results with and without duplicate sediment results averaged was performed. During Cycle 1a of the Anniston PCB sediment toxicity testing program, both the USGS lab and the USACE lab conducted sediment toxicity tests with *Chironomus dilutus* and *Hyalella azteca* exposed to six duplicated sediments. The most sensitive endpoint among both species was *Hyalella azteca* 42-d young/female (normalized to 42-d survival) (Table B-4). Table B-5 compares results of the nonlinear regressions of that reproduction endpoint vs. PCB concentration, with and without the control-normalized results for those sediments averaged. Only five of the six duplicate sediments were included in the regressions because one of the six



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repeated sediments was the lab-control sediment, and the lab-control sediments were not included in the nonlinear regressions (because the Anniston sediment responses were normalized to their within-batch control responses). As shown in Table B-6, when the nonlinear-regression results were compared with and without the duplicate sediment results averaged, the results are similar with and without averaging the duplicate sediments. A comparison of which OU-4 sediments selected for the testing program exceeded the reference envelope response for each endpoint for *C. dilutus* and *H. azteca* are provided in Tables B-7 and B-8, respectively.

#### 4. Summary of Findings

Results of the site-specific toxicity testing indicate that toxicity thresholds could range from approximately 1.38 to 165 mg/kg dw depending on the species and endpoint tested and the effect level that is considered most relevant. For the most sensitive endpoint and species (i.e., *H. azteca* 42-d young/female normalized to 42-d survival), the range of results were 1.38 (the EC0\*), 2.58 (the EC10\*), and 4.43 (the EC20\*) mg tPCB<sub>A</sub>/kg dw of sediment.

#### 5. References

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**Tables** 

Concentrations of total PCB Aroclors (tPCB<sub>A</sub>) predicted to decrease growth, survival, or reproduction by *Chironomus dilutus* or *Hyalella azteca* exposed to OU-4 sediments from the Anniston PCB Site by 0, 10, 20, and 50% relative to the lowest reference-sediment response.

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Species	Endpoint	Dry-weight	normalized co	onc. (mg tPCB	<sub>A</sub> /kg dw sed)	OC-normalized conc. (mg tPCB <sub>A</sub> /kg OC)					
Орослос	Ziiapoiiii	EC0*a	EC10* a	EC20* a	EC50* a	EC0*a	EC10* a	EC20* a	EC50* a		
C. dilutus	13-d survival	14.2	75.7	123	288	1,000	3,710	5,570	11,500		
	13-d ash-free dry weight	6	17.3	32.3	121	322	880	1,610	5,790		
	13-d biomass per replicate chamber	9.65	17.7	28	85.7	346	711	1,170	3,670		
	Emergence percentage	2.04	6.8	14.3	71.2	170	465	873	3,410		
	Emergence time	b	b	b	b	b	b	b	b		
	Adult survival time	98	186	323	1,420	4,580	8,320	13,900	55,200		
	No. of egg cases	21.1	31.4	45.9	146	1,160	1,660	2,310	6,440		
	No. of eggs/egg case	b	b	b	b	b	b	b	b		
	Hatch percentage	b	b	b	b	b	b	b	b		
	Total young	69.4	89	114	261	3,390	4,150	5,080	9,950		
	Young/egg case	209	260	324	685	8,390	9,890	11,700	20,800		
	Adult biomass per replicate chamber <sup>c</sup>	0.43	1.19	2.54	16.5	58.2	131	241	1,050		
H. azteca	28-d survival	UND <sup>d</sup>	105	152	261	UND <sup>d</sup>	4,636	6,390	10,400		
	28-d dry weight	b	b	b	b	b	b	b	b		
	28-d biomass per replicate chamber	1.69	25.1	57.7	252	UND <sup>d</sup>	4,880	7,600	11,900		
	28-d length	b	b	b	b	b	b	b	b		
	42-d survival	31	127	165	262	2,380	5,250	6,690	10,300		
	42-d dry weight	b	b	b	b	b	b	b	b		
	42-d biomass per replicate chamber	18.2	39.6	67.7	231	1,220	2,520	3,930	10,200		
	42-d length	b	b	b	b	b	b	<sup>b</sup>	b		
	42-d total young	9.18	12.8	17.8	50.1	453	627	866	2,480		
	42-d young/female	1.46	3	5.42	25.6	102	181	302	1,270		
	42-d young/female (normalized to 42-d survival)	1.38	2.58	4.43	19.8	72.8	120	195	902		

<sup>&</sup>lt;sup>a</sup> EC0\*, EC10\*, EC20\* and EC50\* are the regression-predicted PCB<sub>A</sub> concentrations that would cause an additional 0%, 10%, 20%, or 50% effect beyond the lowest response measured in the reference sediments (i.e., 1×, 0.9×, 0.8×, and 0.5× the response at the "bottom" of the reference envelope).

<sup>&</sup>lt;sup>b</sup> Could not be calculated because a decreasing concentration-response relationship did not exist for this endpoint.

<sup>&</sup>lt;sup>c</sup> Estimated as adult emergence × 13-d ash-free dry weight, assuming adult ash-free dry weight (which was not measured) for each sediment was proportional to the 13-d ash-free dry weight that was measured for the sediment. Therefore, this endpoint has high uncertainty associated with it.

<sup>&</sup>lt;sup>d</sup> UND: undefined EC0\*, because the lowest control-normalized reference-sediment response (88.8%) was greater than the regression-predicted maximum control-normalized mg tPCBA/kg dw sed: milligrams total polychlorinated biphenyl Aroclor per kilogram dry weight sediment mg tPCBA/kg OC: milligrams total polychlorinated biphenyl Aroclor per kilogram organic carbon

Variability among toxicity-endpoint responses in the laboratory-control sediments tested in the three batches of OU-4 sediments from the Anniston PCB Site.

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Species	Endpoint	Control resp	Range of control responses (% of mean of controls)		
		1	2	3	inean or controls)
C. dilutus	13-d survival (%)	93.8	97.9	95.8	4.4
	13-d ash-free dry weight (mg/individual)	0.93	1.41	0.96	43.6
	13-d biomass per replicate chamber (mg)	10.4	16.5	11	47.5
	Emergence (%)	77.1	74	67.7	12.9
	Emergence time (d)	31.6	27.2	23.9	27.7
	Adult survival time (d)	6.8	4.8	6.1	34.2
	No. of egg cases	4.1	3	4.4	35.9
	No. of eggs/egg case	850	1,100	1,030	25.2
	Hatch (%)	90.9	93.6	89.6	4.4
	Total young	3,080	2,950	4,090	33.6
	Young/egg case	770	1,040	930	29.8
	Adult biomass per replicate chamber (mg) <sup>c</sup>	8.1	12.2	7.5	51
H. azteca	28-d survival (%)	97.5	99.2	96.7	2.6
	28-d dw (mg/individual)	0.23	0.36	0.24	45.9
	28-d biomass per replicate chamber (mg)	2.21	3.44	2.33	46
	28-d length (mm)	4.06	4.7	3.77	22.1
	42-d survival (%)	92.5	93.8	93.8	1.3
	42-d dw (mg/individual)	0.42	0.63	0.28	79.5
	42-d biomass per replicate chamber (mg)	3.83	5.97	2.62	80.8
	42-d length (mm)	4.52	5.21	4.35	18.2
	42-d total young	19.8	36.4	10.5	116.5
	42-d young/female	4.2	9.1	2.1	137.2
	42-d young/female (normalized to 42-d survival)	3.8	8.1	1.9	135.2

<sup>&</sup>lt;sup>a</sup> For *C. dilutus*, Batch 1, 2, and 3 tests were conducted at USGS-CERC, USACE-ERDC, and USGS-CERC, respectively; for *H. azteca*, Batch 1, 2, and 3 tests were conducted at USACE-ERDC, USGS-CERC, and USACE-ERDC, respectively.

<sup>&</sup>lt;sup>b</sup> Equals 100%·[max(control response) - min(control response)]/mean(control response).

<sup>&</sup>lt;sup>c</sup> Estimated as adult emergence × 13-d ash-free dry weight, assuming adult ash-free dry weight (which was not measured) for each sediment was proportional to the 13-d ash-free dry weight that was measured for the sediment. Therefore, this endpoint has high uncertainty associated with it.

Regression coefficients for the concentration-response curves in Figures B-2 and B-3. The logistic equation to which the toxicity data were fit is: R = Rmax/[1 + (tPCBA/EC50)slope], where R = response value (% of control), Rmax = regression-fitted maximum response (% of control), tPCBA = total PCB Aroclor concentration (mg/kg dry sediment or mg/kg OC), EC50 = regression-fitted 50% effect concentration of tPCBA (mg/kg dry sediment or mg/kg OC), and slope = slope of the logistic regression of R vs. tPCBA concentration.

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Species	Endpoint	Regression	s using dw-nor tPCBA/kg d	malized concen w sediment)	tration (mg	Regressions using OC-normalized concentration (mg tPCBA/kg OC)					
		R <sub>max</sub>	Slope	EC50	EC0* a	R <sub>max</sub>	Slope	EC50	EC0* a		
C. dilutus	13-d survival	98.63	1.598	285	14.2	98.85	1.8746	11,360	1,000		
	13-d ash-free dry weight	111.6	0.9218	104.28	6	111.98	0.9426	4,984	322		
	13-d biomass per replicate chamber	111.74	0.9578	63.76	9.65	113.26	0.9896	2,957	346		
	Emergence percentage	96.64	0.7435	57.91	2.04	96.89	0.8714	2,845	170		
	Emergence time	<sup>b</sup>	b	b	b	b	b	b	b		
	Adult survival time	82.59	0.6472	723.86	98	82.73	0.693	29,278	4,580		
	No. of egg cases	77.54	0.7141	54.81	21.1	78.53	0.7968	2,620	1,160		
	No. of eggs/egg case	<sup>b</sup>	b	b	b	b	b	b	b		
	Hatch percentage	<sup>b</sup>	b	b	b	b	b	b	b		
	Total young	76.3	0.874	84.15	69.4	76	1.0773	3,992	3,390		
	Young/egg case	99.77	0.9168	201.31	209	99.24	1.203	8,218	8,390		
	Adult biomass per replicate chamber c	121.3	0.5693	9.92	0.43	120.12	0.7349	721	58.2		
H. azteca	28-d survival	85.93	2.7541	267.39	UND <sup>d</sup>	86.48	3.0335	10,566	UND <sup>d</sup>		
	28-d dw	b	b	b	b	b	b	b	b		
	28-d biomass per replicate chamber	87.46	0.9186	246.96	1.69	80.23	3.7766	12,374	UND⁴		
	28-d length	b	b	b	b	b	b	b	b		
	42-d survival	84.14	3.0052	261.5	31	84.87	3.1362	10,247	2,380		
	42-d dw	b	b	b	b	b	b	b	b		
	42-d biomass per replicate chamber	92.02	0.9233	183.8	18.2	89.03	1.2498	9,051	1,220		
	42-d length	b	b	b	b	b	b	b	b		
	42-d total young	105.06	0.7511	16.83	9.18	112.71	0.7078	676	453		
	42-d young/female	136.99	0.6403	14.04	1.46	147.74	0.6373	573	102		
	42-d young/female (normalized to 42-d survival)	129.99	0.6256	9.27	1.38	161.93	0.5089	183	72.8		

<sup>&</sup>lt;sup>a</sup> EC0\* is the regression-predicted PCB<sub>△</sub> concentration at the lowest response measured in the reference sediments (i.e., the "bottom" of the reference envelope) for that endpoint.

mg tPCBA/kg dw sed: milligrams total polychlorinated biphenyl Aroclor per kilogram dry weight sediment mg tPCBA/kg OC: milligrams total polychlorinated biphenyl Aroclor per kilogram organic carbon

<sup>&</sup>lt;sup>b</sup> Could not be calculated because a decreasing concentration-response relationship did not exist for this endpoint.

<sup>&</sup>lt;sup>c</sup> Estimated as adult emergence × 13-d ash-free dry weight, assuming adult ash-free dry weight (which was not measured) for each sediment was proportional to the 13-d ash-free dry weight that was measured for the sediment. Therefore, this endpoint has high uncertainty associated with it.

<sup>&</sup>lt;sup>d</sup> UND: undefined EC0\*, because the lowest control-normalized reference-sediment response (88.8%) was greater than the regression-predicted maximum control-normalized response (85.9%).

Independent and averaged *Hyalella azteca* 42-d young/female (normalized to 42-d survival), for the six sediments that were tested in both the USGS and the USACE labs during Cycle 1a.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek
Appendix B Analysis of OU 4 Sediment Toxicity Test Results and Development of Site-Specific Risk-Based
Concentrations for PCBs in Sediment
Anniston PCB Site, Anniston, Alabama

Sediment I.D.	PCB Aroclors (mg/kg dw)	OC-normalized PCB Aroclors (mg/kg OC)	Reproduction (% of control)				
	. •2 / • • • • • • • • • • • • • • • • •		USGS	USACE	Average		
6	59.9	4,504	8.2	5.9	7.1		
11	85.5	3,393	19.8	37.1	28.5		
19	437	16,873	0	0	0		
25	26.3	1,015	53.4	54.4	53.9		
30	204	8,870	17.1	16.4	16.7		
33	0.06	5	100	100	100		

mg/kg dw: milligrams per kilogram dry weight mg/kg OC: milligrams per kilogram organic carbon

PCB: polychlorinated biphenyls

USACE: United States Army Corps of Engineers

USGS: United States Geological Survey

Nonlinear regression fits for Hyalella azteca 42-d young/female (normalized to 42-d survival) fitted to all USGS and USACE sediment data from Cycles 1a and 1b, with and without the results for the duplicate sediments averaged. Regression equation was: Response = Maxresponse/(1+[PCB/EC50)^slope], where Response is the within-batch control-normalized percent reproduction.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek
Appendix B Analysis of OU 4 Sediment Toxicity Test Results and Development of Site-Specific RiskBased Concentrations for PCBs in Sediment
Anniston PCB Site, Anniston, Alabama

PCB Concentration	Parameter	Without averaging	With averaging	Units
	Maxresp	130	131.8	%
PCB Aroclors	Slope	0.6257	0.5817	
	EC50	9.265	8.794	mg/kg dw
00 " 1000	Maxresp	161.9	189.7	%
OC-normalized PCB Aroclors	Slope	0.5089	0.4168	
1 11 2 0 10 10	EC50	183.4	78	mg/kg OC

mg/kg dw: milligrams per kilogram dry weight mg/kg OC: milligrams per kilogram organic carbon

PCB: polychlorinated biphenyls

Table B-6

Inhibition concentrations (relative to the bottom of the reference envelope) in Anniston PCB sediment toxicity tests, for Hyalella azteca 42-d young/female (normalized to 42-d survival) with and without the results for the duplicate sediments averaged.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek
Appendix B Analysis of OU 4 Sediment Toxicity Test Results and Development of Site-Specific
Risk-Based Concentrations for PCBs in Sediment
Anniston PCB Site, Anniston, Alabama

PCB Concentration	Parameter	Without averaging	With averaging	Units
	EC0*	1.38	1.26	mg/kg dw
PCB Aroclors	EC10*	2.58	2.4	mg/kg dw
F CB AIOCIOIS	EC20*	4.43	4.23	mg/kg dw
	EC50*	19.8	20.7	mg/kg dw
	EC0*	72.8	61.2	mg/kg OC
OC-normalized PCB	EC10*	120	101	mg/kg OC
Aroclors	EC20*	195	169	mg/kg OC
	EC50*	902	928	mg/kg OC

mg/kg dw: milligrams per kilogram dry weight mg/kg OC: milligrams per kilogram organic carbon

PCB: polychlorinated biphenyls

Table B-7

Results of toxicity tests with *Chironomus dilutus* exposed to OU-4 sediments from the Anniston PCB Site, Anniston, Alabama. Responses in OU-4 sediments are expressed as a percentage of the lowest response recorded among the six reference sediments (i.e., bottom-of-reference-envelope response), after all OU-4 and reference sediments had first been normalized to the control response within the batch in which they were tested.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek

Appendix B Analysis of OU 4 Sediment Toxicity Test Results and Development of Site-Specific Risk-Based Concentrations for PCBs in Sediment

Anniston PCB Site, Anniston, Alabama

Transformed results (% of bottom-of-reference-envelope response) sorted by PCB-Aroclor concentration

					13-d Total	13-d Ind.		Median emer-	Median adult					
	Sedi-		PCB-	13-d	ash-free	ash-free	Emer-	gence	survival					
	ment	PCB-A	A/OC	Survival	biomass	dry wt	gence	time	time	# Egg	# Eggs/		Total #	# Young/
Location	ID	(mg/kg)	(mg/kg)	(%)	(mg)	(mg)	(%)	(days) <sup>a</sup>	(days)	cases	egg case	Hatch (%)	young	egg case
TX10	16	0.05	18.1	93.3	98.9	106.9	96.6	106.1	147.2	138.7	138.4	148.8	195.7	211.5
TX20	28	0.22	30.6	106.7	138.1	128.3	103.4	99.4	124.1	110.9	159.7	124.7	158.0	242.7
TX20	24	0.27	122.7	103.7	116.7	111.5	105.2	105.6	101.8	94.3	145.1	144.5	133.9	215.2
TX40	15	0.60	40.8	97.8	80.6	82.5	74.1	109.8	151.1	133.1	123.5	146.9	176.1	213.8
TX60	20	2.42	350.2	104.4	90.7	86.4	103.4	103.5	119.3	166.4	122.7	141.8	204.7	210.6
TX60	20 <sup>c</sup>	3.08	277.5	93.1	90.9	97.0	78.8	75.8	84.3	76.5	146.7	146.9	126.4	224.2
TX30	23	4.90	235.6	102.2	102.2	99.3	100.0	105.0	151.1	144.2	135.4	139.0	198.7	222.5
TX40	27	7.28	667.9	100.0	71.8	71.5	70.7	104.6	149.5	122.0	126.5	142.8	156.6	211.7
TX60	13	12.40	837.8	95.6	100.0	104.3	86.2	104.0	135.2	133.1	130.8	148.8	187.3	199.7
TX30	25	26.30	1015.4	106.8	82.8	77.1	57.5	73.5	61.4	47.1	161.0	145.7	79.0	174.0
TX30	25 <sup>b</sup>	26.30	1015.4	97.9	49.1	50.1	104.2	80.8	150.2	137.5	163.3	140.3	242.9	268.1
TX40	1	27.00	1436.2	106.8	68.9	64.2	72.7	82.3	97.1	100.0	121.0	140.4	129.1	154.7
TX40	14	28.30	1481.7	68.9	98.4	147.7	72.4	100.8	127.2	133.1	134.3	145.0	190.2	200.0
TX-30	2	37.10	1212.4	95.6	84.1	87.3	39.7	110.4	80.0	33.3	124.9	110.8	36.4	87.1
TX40	17	37.80	3500.0	73.3	98.0	136.1	79.3	118.7	116.1	88.7	120.0	138.2	103.6	171.7
TX60	6	59.90	4503.8	109.0	38.6	35.1	9.1	93.5	57.1	5.9	138.0	0.0	0.0	0.0
TX60	6 <sup>b</sup>	59.90	4503.8	84.8	25.9	31.7	28.4	85.9	129.9	32.4	151.0	139.2	48.2	92.5
TX30	7	65.40	1639.1	100.0	60.8	59.9	46.9	79.3	89.5	70.6	147.4	135.8	110.1	149.2
TX50	11	85.50	3392.9	102.2	80.4	78.1	92.4	81.4	85.7	111.8	134.0	135.3	145.5	191.1
TX50	11 <sup>b</sup>	85.50	3392.9	97.9	56.2	56.4	94.7	76.3	142.1	145.6	114.8	137.6	167.8	185.7

Results of toxicity tests with *Chironomus dilutus* exposed to OU-4 sediments from the Anniston PCB Site, Anniston, Alabama. Responses in OU-4 sediments are expressed as a percentage of the lowest response recorded among the six reference sediments (i.e., bottom-of-reference-envelope response), after all OU-4 and reference sediments had first been normalized to the control response within the batch in which they were tested.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek

Appendix B Analysis of OU 4 Sediment Toxicity Test Results and Development of Site-Specific Risk-Based Concentrations for PCBs in Sediment

Anniston PCB Site, Anniston, Alabama

#### Transformed results (% of bottom-of-reference-envelope response) sorted by PCB-Aroclor concentration

					13-d Total	13-d Ind.		Median emer-	Median adult					
Location	Sedi- ment ID	PCB-A (mg/kg)	PCB- A/OC (mg/kg)	13-d Survival (%)	ash-free biomass (mg)	ash-free dry wt (mg)	Emer- gence (%)	gence time (days) <sup>a</sup>	survival time (days)	# Egg cases	# Eggs/ egg case	Hatch (%)	Total # young	# Young/ egg case
TX50	30	204.00	8869.6	77.2	30.0	39.1	48.5	73.9	95.7	88.2	183.3	136.6	163.0	262.2
TX50	30 <sup>b</sup>	204.00	8869.6	21.7	4.9	21.5	6.3	91.8	135.3	16.2	62.5	140.2	10.7	12.8
TX50	8	320.00	11594.2	61.3	22.2	35.8	33.3	90.0	77.1	52.9	174.0	136.8	88.3	248.3
TX50	19	437.00	16872.6	61.3	16.8	27.1	4.5	88.1	68.6	0.0	NA	NA	0.0	0.0
TX30	18	476.00	18030.3	22.7	4.2	20.6	4.5	83.0	51.4	0.0	NA	NA	0.0	0.0
TX30	18 <sup>b</sup>	476.00	18030.3	10.9	2.4	22.5	0.0	NA	NA	0.0	NA	NA	0.0	0.0

100% and higher of response (≥EC0\*)
90-99% of response (<EC0\* - EC10\*)
80-89% of response (<EC10\* - EC20\*)
70-79% of response (<EC20\* - EC30\*)
60-69% of response (<EC30\* - EC40\*)
50-59% of response (<EC40\* - EC50\*)
<50% response (below EC50\*)

#### Notes:

NA = not applicable; endpoint could not be calculated because of no survival or reproduction.

<sup>&</sup>lt;sup>a</sup> Effect becomes more adverse as emergence time increases beyond the reference envelope. These values were compared to the maximum of the reference envelope responses, to calculate percentage of emergence time beyond the maximum reference response. Therefore, cooler colors are the lower values for this endpoint.

<sup>&</sup>lt;sup>b</sup> Split sample tested by Army Corps of Engineers (ACOE) and U.S. Geological Survey (USGS).

<sup>&</sup>lt;sup>c</sup> Sediment tested twice by U.S. Geological Survey (USGS).

Results of toxicity tests with *Hyalella azteca* exposed to OU-4 sediments from the Anniston PCB Site, Anniston, Alabama. Responses in OU-4 sediments are expressed as a percentage of the lowest response recorded among the six reference sediments (i.e., bottom-of-reference-envelope response), after all OU-4 and reference sediments had first been normalized to the control response within the batch in which they were tested.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek

Appendix B Analysis of OU 4 Sediment Toxicity Test Results and Development of Site-Specific Risk-Based Concentrations for PCBs in Sediment

Anniston PCB Site, Anniston, Alabama

Transformed results (% of bottom-of-reference-envelope response) sorted by PCB-Aroclor concentration

														42-d Repro-
					28-d	28-d			42-d				42-d	duction
					Meas-	Meas-			Meas-	42-d Meas-			Repro-	(young/
		DOD A	PCB-	28-d	ured total	ured ind.	28-d	42-d	ured total	ured ind.	42-d		duction	female; 42-d
Location	Sed ID	PCB-A (mg/kg)	A/OC (mg/kg)	Survival	biomass	dry wt	Length	Survival	biomass	dry wt	Length	Total #	(young/	
			(mg/kg)	(%)	(mg)	(mg)	(mm)	(%)	(mg)	(mg)	(mm)	Young	female)	normal.) <sup>b</sup>
TX10	16	0.05	18.1	98.1	69.9	83.3	96.6	93.7			98.9			18.3
TX20	28	0.22	30.6	106.8		94.7	112.6	106.3		144.9	106.4			
TX20	24	0.27	122.7	100.0	96.2	126.7	108.9	109.5		125.9	100.7	140.7	105.3	
TX40	15	0.60	40.8	95.1	109.3	117.5	106.4	92.1	113.7	161.8	105.8	148.1	113.5	
TX60	20	3.08	277.5	93.4	91.9	114.3	108.0	107.8	98.5	111.2	102.9	104.4	56.1	65.5
TX30	23	4.90	235.6	104.9	81.8	81.1	101.2	95.2	100.4	129.7	101.4	114.8	78.5	70.2
TX40	27	7.28	667.9	97.1	92.5	100.3	105.3	95.2	128.8	161.4	101.0	137.0	102.6	103.2
TX60	13	12.40	837.8	90.3	67.2	92.4	108.4	92.1	84.6	111.8	96.8	24.1	20.2	18.5
TX30	25	26.30	1015.4	104.9	91.0	92.4	99.5	106.2	108.4	127.6	105.3	64.0	53.1	53.6
TX30	25 <sup>a</sup>	26.30	1015.4	111.7	101.4	102.8	99.8	127.0	85.6	82.3	94.9	114.4	44.0	54.6
TX40	1	27.00	1436.2	102.0	84.3	103.3	102.3	115.8	84.5	88.8	105.4	96.5	48.3	53.2
TX40	14	28.30	1481.7	95.1	64.7	92.4	102.6	100.0	107.0	131.2	98.7	72.2	78.5	78.9
TX-30	2	37.10	1212.4	38.8	43.3	196.3	114.0	34.9	57.7	221.3	117.9	29.6	67.0	27.7
TX40	17	37.80	3500.0	102.9	107.7	128.5	111.4	101.6	108.8	129.8	104.9	88.9	78.4	77.1
TX60	6	59.90	4503.8	66.4	89.7	151.9	110.7	70.8	81.0	149.5	119.5	13.8	12.9	8.3
TX60	6 <sup>a</sup>	59.90	4503.8	75.7	82.3	109.4	98.9	76.2	55.5	87.6	98.3	9.1	7.1	5.9
TX30	7	65.40	1639.1	74.1	64.6	89.1	94.6	77.2	57.4	90.5	108.2	56.1	43.6	33.3
TX50	11	85.50	3392.9	100.1	86.5	103.5	104.1	109.4	104.3	118.1	103.8	45.3	23.1	19.9
TX50	11 <sup>a</sup>	85.50	3392.9	104.1	97.8	96.7	99.9	109.5	90.2	100.2	100.9	74.8	33.7	37.3
TX50	30	204.00	8869.6	42.4	58.4	152.4	115.9	45.0	84.6	313.1	114.4	22.6	42.3	17.1

Results of toxicity tests with *Hyalella azteca* exposed to OU-4 sediments from the Anniston PCB Site, Anniston, Alabama.

Responses in OU-4 sediments are expressed as a percentage of the lowest response recorded among the six reference sediments (i.e., bottom-of-reference-envelope response), after all OU-4 and reference sediments had first been normalized to the control response within the batch in which they were tested.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek

Appendix B Analysis of OU 4 Sediment Toxicity Test Results and Development of Site-Specific Risk-Based Concentrations for PCBs in Sediment

Anniston PCB Site, Anniston, Alabama

Transformed results (% of bottom-of-reference-envelope response) sorted by PCB-Aroclor concentration

					28-d Meas-	28-d Meas-			42-d Meas-	42-d Meas-			42-d Repro-	42-d Repro- duction (young/
Location	Sed ID	PCB-A (mg/kg)	PCB- A/OC (mg/kg)	28-d Survival (%)	ured total biomass (mg)	ured ind. dry wt (mg)	28-d Length (mm)	42-d Survival (%)	ured total biomass (mg)	ured ind. dry wt (mg)	42-d Length (mm)	Total # Young	duction (young/ female)	female; 42-d normal.) <sup>b</sup>
TX50	30 <sup>a</sup>	204.00	8869.6	90.9	87.5	93.9	98.9	87.3	72.7	102.5	100.3	27.8	19.4	16.5
TX50	8	320.00	11594.2	51.0	51.6	109.8	105.6	53.1	53.0	134.5	117.5	2.0	1.4	1.2
TX50	19	437.00	16872.6	5.8	4.9	190.2	NA	8.0	11.1	166.1	109.1	0.0	0.0	0.0
TX50	19 <sup>a</sup>	437.00	16872.6	22.7	36.8	113.5	97.2	12.7	11.8	122.2	110.5	0.0	0.0	0.0
TX30	18	476.00	18030.3	6.7	19.9	365.1	NA	6.4	20.9	393.7	141.4	0.0	0.0	0.0

100% and higher of response (≥EC0\*)
90-99% of response (<EC0\* - EC10\*)
80-89% of response (<EC10\* - EC20\*)
70-79% of response (<EC20\* - EC30\*)
60-69% of response (<EC30\* - EC40\*)
50-59% of response (<EC40\* - EC50\*)
<50% response (below EC50\*)

#### Notes:

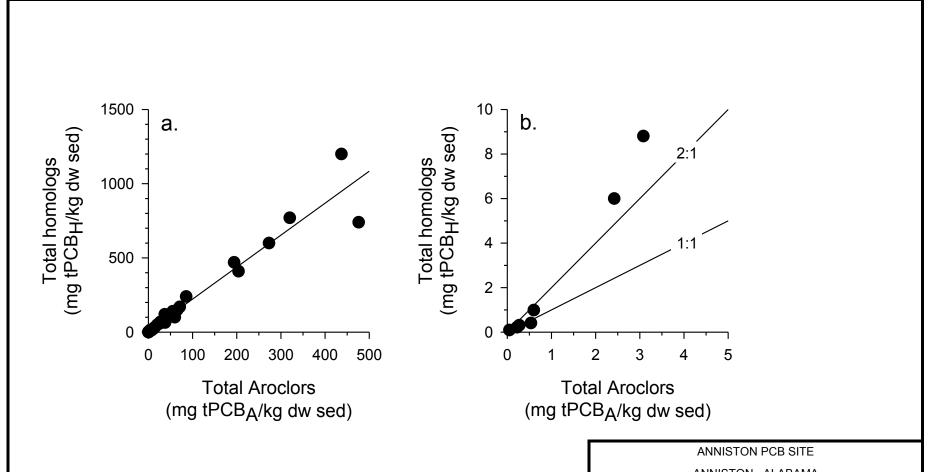
NA = not applicable; endpoint could not be calculated because of no survival or reproduction.

<sup>&</sup>lt;sup>a</sup> Split sample tested by Army Corps of Engineers (ACOE) and U.S. Geological Survey (USGS).

<sup>&</sup>lt;sup>b</sup> 42-day reproduction (young/female) normalized to survival of adult females.



**Figures** 



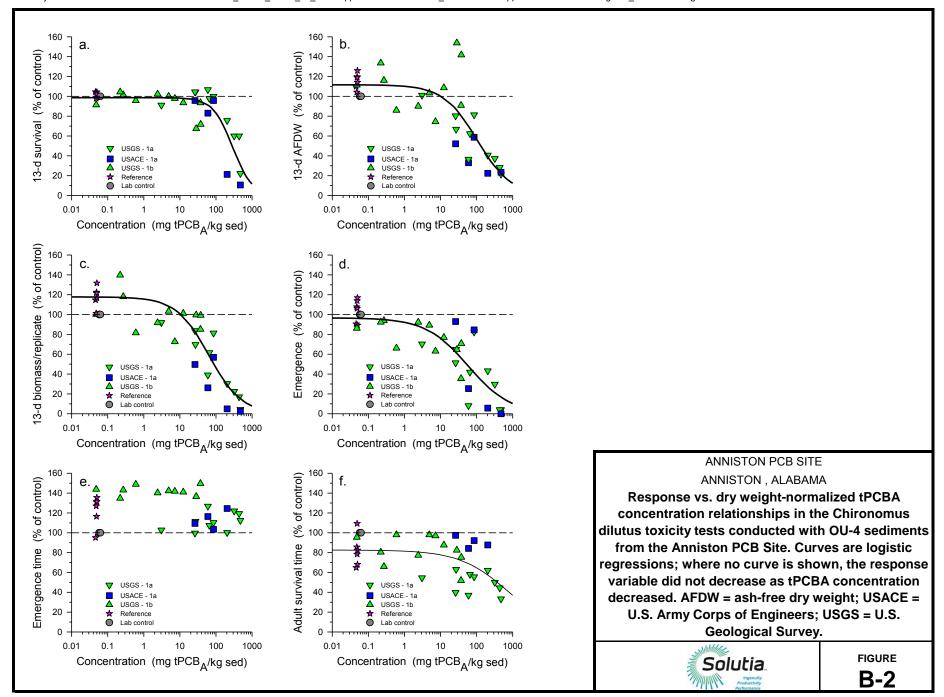
ANNISTON, ALABAMA

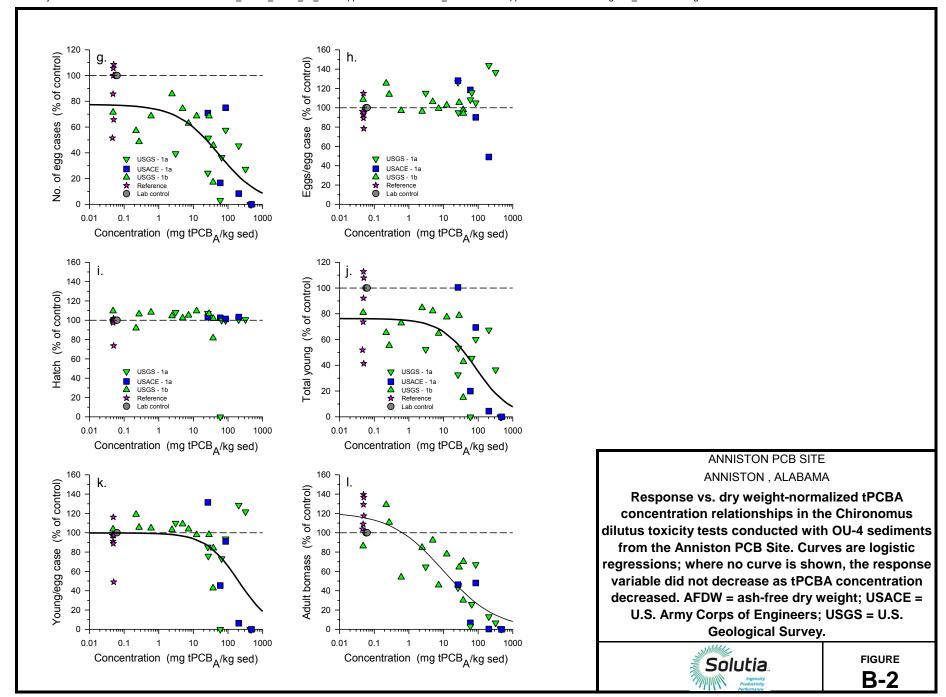
Relationship between total PCB homolog (tPCBH) and total PCB Aroclor (tPCBA) concentrations in OU-4 sediments collected for toxicity testing. (a) All the sediments; the least-squares regression fit (the diagonal line) is tPCBH = 2.154×tPCBA + 7.363. (b) Only the 7 sediments having <4 mg tPCBA/kg dw sediment; the diagonal lines show homolog:Aroclor ratios of 2:1 and 1:1 for illustrative purposes.

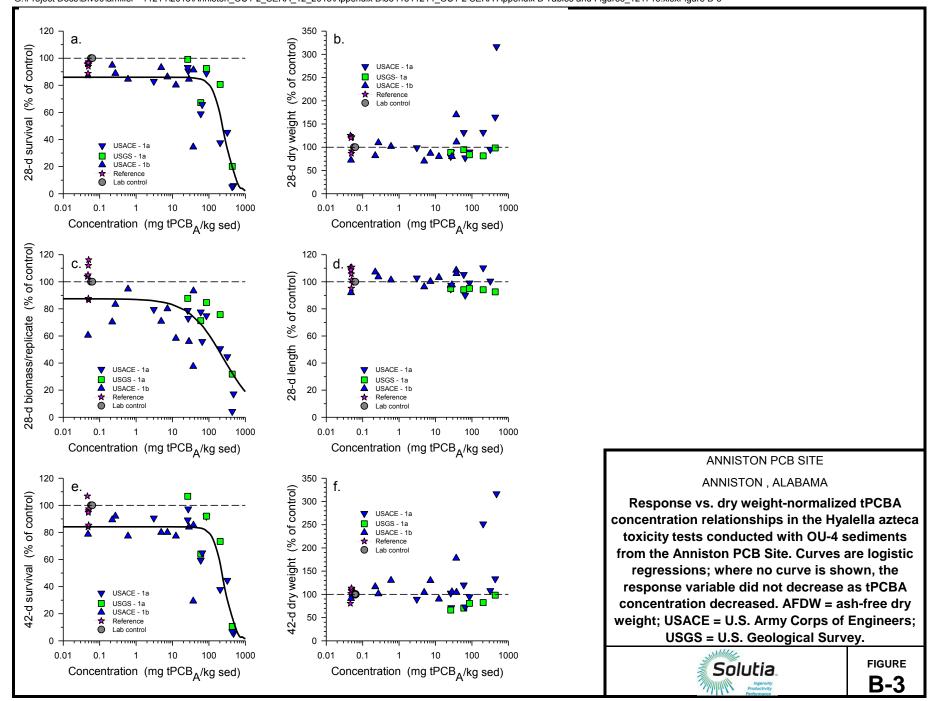


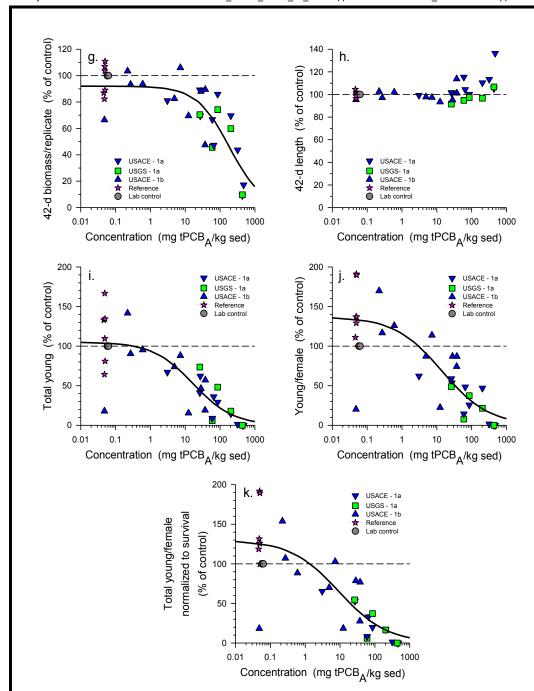
**FIGURE** 

**B-1** 









#### ANNISTON PCB SITE

ANNISTON, ALABAMA

Response vs. dry weight-normalized tPCBA concentration relationships in the Hyalella azteca toxicity tests conducted with OU-4 sediments from the Anniston PCB Site. Curves are logistic regressions; where no curve is shown, the response variable did not decrease as tPCBA concentration decreased. AFDW = ash-free dry weight; USACE = U.S. Army Corps of Engineers; USGS = U.S. Geological Survey.



FIGURE

**B-3** 



## Appendix C

Development of Toxicity Reference Values for Birds and Mammals



Pharmacia LLC and Solutia Inc.

Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek

Appendix C: Development of Toxicity Reference Values for Birds and Mammals

Anniston PCB Site, Anniston, Alabama

December 2013 Revision 2





1.	Intro	ntroduction									
2.	PCB TRVs										
	2.1	Avian I	Dietary PCB TRVs		2						
		2.1.1	High End of Sensitivity Range		3						
		2.1.2	Mid-Range of Sensitivity		4						
	2.2	Mamm		4							
3.	Merc	ury TR	Vs		5						
	3.1	Avian I	Dietary Mercury TRVs		5						
	3.2	Mamm	alian Dietary Mercury TRVs		6						
4.	Othe	r Metal	Dietary TRVs		7						
5.	References										

#### **Tables**

Table C-1 Summary of Avian and Mammalian Toxicity Reference Values
 Table C-2 Summary of Chicken PCB Toxicity Data Considered for Toxicity Reference Value Development
 Table C-3 Summary of Non-Chicken Avian Dietary PCB Toxicity Data Considered for Toxicity Reference Value Development
 Table C-4 Summary of Non-Mink Dietary PCB Toxicity Data Considered for Toxicity Reference Value Development





#### **Acronyms and Abbreviations**

AHR aryl hydrocarbon receptor

EcoSSL Ecological Soils Screening Levels

COPC constituent of potential concern

DLC dioxin-like compound

kg kilogram(s)

kg/kg BW-d kilograms per kilogram of body weight per day

LOAEL lowest-observed adverse effects level

mg/kg milligrams per kilogram

mg/kg BW-d milligrams per kilogram of body weight per day

NOAEL no-observed adverse effects level

OU Operable Unit

p probability of a type 1 error

PCB polychlorinated biphenyl

SERA Streamlined Ecological Risk Assessment

TRV toxicity reference value

USEPA U.S. Environmental Protection Agency

ww wet weight



Development of Toxicity Reference Values for Birds and Mammals

#### 1. Introduction

This document describes the identification of toxicity reference values (TRVs) for birds and mammals that will be used to evaluate potential risk to avian and mammalian receptors being evaluated in the *Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek* (SERA), to which this document is an appendix. The problem formulation identified dietary exposure as the most likely and significant exposure, thus, this document describes the development of dietary TRVs for the specified constituents of potential concern (COPCs). The COPCs being evaluated in the SERA are: polychlorinated biphenyls (PCBs), barium, chromium, cobalt, lead, manganese, mercury, nickel and vanadium.

Following U.S. Environmental Protection Agency (USEPA) guidance (1997), TRVs were developed based on endpoints that could result in population-level impacts such as survival, reproduction, development, and growth. The dietary dose-based TRV is defined as a daily dose of a chemical expressed in milligrams of chemical per kilogram of body weight per day (mg/kg BW-d). TRVs are generally developed to represent a dose associated with no-observed adverse effects levels (NOAEL or low TRV) or lowest-observed adverse effects levels (LOAEL or high TRV). TRVs were developed herein by considering the toxicity data available in the peer-reviewed literature using the following criteria as a guideline:

- 1. Close relatedness of the test species to the wildlife receptor of concern
- 2. Chronic duration of exposure and/or included sensitive life stages to evaluate potential developmental and reproductive effects
- 3. Measurement of ecologically relevant endpoints
- 4. Minimal impact of co-contaminants.

For PCBs and mercury, the primary literature was reviewed to develop TRVs. For other metals, dietary TRVs were taken from available sources commonly used in ecological risk assessment. Specifically, for the remaining seven metals, except for the avian TRVs for barium, TRVs were taken from USEPA Ecological Soil Screening Level (USEPA EcoSSL)<sup>1</sup> Guidance (USEPA 2005 and 2007). The avian TRVs for barium were taken from Oak Ridge National Laboratory Toxicological Benchmarks for Wildlife (Sample et al. 1996). The following sections describe the specific details of TRV development.

<sup>&</sup>lt;sup>1</sup> Only NOAEL values are available in EcoSSL documents. LOAELs were developed from the underlying datasets as described in Section 3.



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#### 2. PCB TRVs

The following sections describe the development of dietary TRVs for PCBs. TRVs are summarized in Table C-1.

#### 2.1 Avian Dietary PCB TRVs

For the SERA, avian PCB TRVs were developed based on the available toxicity data for all avian species. Individual avian studies were evaluated to select the most relevant study or studies based on the criteria described in Section 1 (i.e., relatedness of the test species, chronic duration/sensitive life stage of exposure, ecologically relevant endpoints, and minimal co-contaminants).

In considering the relatedness of the laboratory test species to the species of interest at the Operable Unit (OU)-1/OU-2 portion of Snow Creek, the relevance of the domestic chicken (the most common test species in the toxicity dataset) to wild species was considered. While TRVs are most often based on species other than the actual receptor species being evaluated, as detailed in USEPA (2003), the use of laboratory tested species to represent communities relies on the assumption that the tested species are an unbiased sample of the community. USEPA (2003) further explains that although test species are not chosen randomly, there is no reason to expect that the selection is biased because species sensitivities are unknown prior to testing. However, the available avian toxicological data clearly show that the domestic chicken is more sensitive to the effects of PCBs than the other species tested (Tables C-2 and C-3).

Recent research conducted by Dr. Sean Kennedy and others has focused on identifying specific mechanisms behind avian sensitivities to PCBs and other dioxin-like compounds (DLCs) (Karchner et al. 2006; Head and Kennedy 2010; Farmahin et al. 2012). This research has correlated differences in the genetic structure of the aryl hydrocarbon receptor (AHR) in avian species to species-specific sensitivity to DLCs. Specifically, research has demonstrated that there are three primary AHR types that are associated with high (type 1), moderate (type 2), and low sensitivity (type 3) to DLCs. The genetic sequence of the AHR has been identified and classified for more than 85 avian species, with the domestic chicken being identified as Type 1/most sensitive (Farmahin et al. 2012). Other identified species for which PCB toxicity studies are available include: pheasant (type 2), wild turkey (type 2), mallard (type 3), kestrel (type 3), and double-crested cormorant (type 3). These relative sensitivities have been established based on the correlation between the available toxicological data (primarily embryo lethality endpoints) and the genetic sequences (Head et al. 2008; Head and Kennedy 2010).

Based on the large disparity in the PCB datasets for chicken and other avian species and the fact that chickens are not related to nor representative of wild species present in the OU-1/OU-2 portion of Snow Creek, development of a range of TRVs to reflect the sensitivity ranges is provided herein. Two sets of avian



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TRVs were developed to represent the high end of the range of sensitivity (based on the chicken dataset) and the mid-range of sensitivity (based on the non-chicken dataset).

Based on the second criteria, studies with a relatively short duration (e.g., less than one month) were only considered if the dose was administered over the course of a sensitive life stage for reproductive effects (i.e., Call and Harrell 1974). Based on these criteria, endpoints such as biomarkers of exposure, pathology (without other supporting endpoints), and behavior were excluded. Lastly, only studies that evaluated PCBs either as Aroclors or total PCBs without other constituents were considered. The toxicity of individual congeners may dramatically over- or underestimate potential toxicity. In most cases, studies using individual congeners were conducted with the most toxic congeners (i.e., PCB 126 and PCB 77) and would overestimate potential toxicity of PCB mixtures. In other words, comparing toxicity based on an individual congener value would be equivalent to assuming that the total concentration of a mixture or mixtures found in the environment are made up of 100% of this congener. Because this is a not supportable assumption, individual congener studies were excluded from consideration. The specific selection of dietary PCB TRVs for high- and mid-range sensitivity species is described below.

Dietary PCB NOAEL- and LOAEL-based TRVs were developed to represent the high end of the range of sensitivity and the mid-range of sensitivity for avian species. The NOAEL is generally selected as the highest NOAEL that is below the lowest LOAEL, and the LOAEL is the lowest relevant effect level observed. For dietary toxicity data, most studies reviewed reported doses as milligrams per kilogram (mg/kg) in diet. Unless specified in the study, it was assumed all dietary doses provided were on a wet weight (ww) basis. To facilitate TRV development, it was necessary to convert these dietary values into body weight normalized daily doses (mg/kg BW-d) using body weight and ingestion rate information for the test species. When this information was not available in the study, the body weight was taken from literature sources, and the ingestion rate was modeled using the allometric equation for all birds from Nagy (2001). Tables C-2 and C-3 summarize the toxicity data considered for chicken and non-chicken species respectively.

#### 2.1.1 High End of Sensitivity Range

Nine studies conducted with domestic chickens were initially considered in the selection of NOAEL and LOAEL TRVs for high sensitivity species. One study, Summer et al. (1996a,b), was excluded from further consideration due to co-contamination in the Great Lakes fish diet fed to the chickens. The literature considered is summarized in Table C-2.

From the remaining eight studies, the LOAEL TRV is based on Lillie et al. (1974) in which a decline in chick growth was observed at 0.13 mg/kg BW-d Aroclor 1254 and 1248. This value is the selected LOAEL and is proposed as the LOAEL TRV for high sensitivity avian species. The chronic NOAEL of 0.043 mg/kg BW-d was estimated by dividing the chronic LOAEL from the Lillie et al. (1974) study by an uncertainty factor of



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three. A factor of 10 is considered excessive based on the range of the NOAEL data reviewed in which the lowest tested NOAEL was 0.065 mg/kg-BW-d (see Table C-2).

#### 2.1.2 Mid-Range of Sensitivity

For mid-range sensitivity (i.e., non-chicken) species, a comprehensive dataset from the peer-reviewed literature was reviewed and considered to select NOAEL and LOAEL TRVs. A total of 14 studies were compiled for consideration, but a study by Custer et al. (1998) was rejected from further review because it was a field-scale study. From the remaining 13 studies, a total of 25 no-effect and 17 low-effect levels were observed for seven different non-chicken avian species, including Japanese quail, mallard, American kestrel, and screech owl (type 3 species); ring-neck pheasant (type 2 species); mourning dove, ring dove and white starling (unsequenced to date). The complete list of dietary PCB studies compiled for review for non-chicken avian species is shown in Table C-3.

The LOAEL from the Koval et al. (1987) study of 1.4 mg/kg BW-d was selected as the LOAEL TRV for the SERA. In this study, mated mourning dove pairs were isolated for 28 days and fed pellets containing 10 mg/kg Aroclor 1254 or control feed ad libitum. At the end of the treatment period, the dividers were removed and observations on reproductive behaviors were initiated. Mourning doves exposed to PCBs at 10 mg/kg resulted in a lower percentage of treated females that laid eggs and an increased time interval between nest occupation and egg laying. The dietary concentration was converted to a dietary dose of 1.4 mg/kg-BW-d using an ingestion rate of 15 g/day (Taber 1928) and a body weight of 0.108 kg (MacMillen 1962). While the study was not designed to measure this endpoint and no statistical analysis was conducted on this result, this value was selected as the basis for the LOAEL TRV for conservatism. This value is also consistent with an egg shell thinning LOAEL observed by Lowe and Stendell (1991) for American kestrels. While the relevance of shell thinning to reproductive output is uncertain, this selection of this study is also protective of this endpoint. In addition, the selected value is generally consistent with, but slightly lower than, the next lowest LOAEL from Dahlgren et al (1972) of 1.8 for reduced hatching success in a chronic study conducted with ring-necked pheasants.

To derive the NOAEL for mid-range sensitivity species, the chronic LOAEL from the Koval et al. (1987) study was divided by an uncertainty factor of three, resulting in the chronic NOAEL of 0.47 mg/kg BW-d. A factor of 10 is considered excessive based on the range of the NOAEL data reviewed in which the lowest measured NOAEL was 0.41 mg/kg-BW-d (see Table C-2).

#### 2.2 Mammalian Dietary PCB TRVs

Following USEPA guidance (1997), dietary TRVs for mammals were developed based on endpoints that could result in population-level impacts such as survival, reproduction, development, and growth. As with avian species, the available toxicity data indicate that mink are more sensitive to PCBs than other



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mammalian species. As mink are not identified as a receptor in the SERA, the development of mammalian TRVs focuses on studies conducted with non-mink mammal species as described below.

A total of 11 studies were considered in the development of PCB dietary TRVs for small mammal species (Table C-4). The mouse and rat comprise most of the available species data, with the exception of two studies reporting toxicity results for the ferret and rabbit. A study conducted by McCoy et al. (1995) reported the lowest effect level of the available data and was selected as the basis for the LOAEL TRV. McCoy et al. (1995) was a multigenerational study with mice and a single dietary exposure of 5 mg/kg Aroclor 1254 for 12 months. This dietary concentration was converted to a daily dose of 0.68 mg/kg BW-d by using a mouse food ingestion rate of 0.135 kg/kg BW-d reported by Linzey (1987), which was not reported by McCoy et al. (1995). This dosage elicited significantly fewer offspring born per month and reduced body weights of newborn mice. Only two sets of bounded NOAEL and LOAEL values were available; however, these NOAELs were higher than the TRV selected for the LOAEL. Thus, a NOAEL TRV of 0.23 mg/kg BW-d was derived by applying an extrapolation factor of three. A factor of 10 would have been excessive based on the fact that the other NOAELs available for non-mink small mammals were higher than the TRV selected for the LOAEL.

#### 3. Mercury TRVs

The following sections describe the development and selection of avian and mammalian dietary TRVs for mercury.

#### 3.1 Avian Dietary Mercury TRVs

As a part of the Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife (USEPA 1995), dietary NOAEL and LOAEL TRVs for mercury were selected based on evaluation of the range of underlying studies available in the peer-reviewed literature. As a part of this process and outlined in the criteria document (USEPA 1995), a comprehensive literature search was conducted, and the evaluation focused on studies that included dose-response data. Studies with both methylmercury and inorganic forms of mercury were considered, with birds demonstrating much greater sensitivity to methylmercury than inorganic forms.

Unlike PCBs, chickens do not appear to be more sensitive to mercury than other wild avian species (Heinz et al. 2009). As such, one set of TRVs are developed herein and will be considered applicable to all avian species evaluated for the OU-1/OU-2 portion of Snow Creek. The studies considered in the USEPA (2005) criteria document focus on endpoints that could result in population-level impacts such as survival, reproduction, development, and growth.



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Because the TRVs provided in the criteria document (USEPA 1995) are based on a literature search conducted in or prior to 1995, other more recent toxicity studies for mercury in avian species were reviewed. Specifically, three studies were identified that provided dose-response data for dietary mercury. These included Albers et al. (2007), Spalding et al. (2000), and Frederick and Javasana (2011), Albers et al. (2007) studied the effects of methylmercury on reproduction of American kestrels and determined the dose of 0.08 ma/ka BW-d<sup>2</sup> resulted in a reduced number of fledglings and decreased percent of nestlings fledged. Frederick and Jayasana (2011) found increased homosexual pairing behavior at a dose of 0.1 mg/kg in diet and also a decrease in egg production at 0.05 mg/kg in diet. There were no significant differences in the number fledglings per female across all dose groups, including the high dose of 0.5 mg/kg in diet. Converting the food concentrations to a daily dose, the range of doses was 0.01 to 0.1 mg/kg BW-d<sup>3</sup> for the range of endpoints evaluated in the study. While the ecological relevance of all of the measured endpoints and observed effects to local populations of birds is not clear, the selected LOAEL TRV for mercury is within this range. The selected LOAEL TRV is based on a study conducted by Spalding et al. (2000). The study determined that dietary methylmercury resulted in adverse effects on growth of great egret nestlings at the low dose of 0.068 mg/kg BW-d<sup>4</sup>. The selected LOAEL from the Spalding et al. (2000) study was divided by an uncertainty factor of three, resulting in the chronic NOAEL of 0.023 mg/kg BW-d. A factor of 10 is considered excessive based on the range of the data considered and the selection of a LOAEL TRV that is based on the lowest value in this range.

#### 3.2 Mammalian Dietary Mercury TRVs

As for avian species, the Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife (USEPA 1995) provides the basis for the selection of mammalian dietary TRVs. Values developed for use in the USEPA (1995) criteria document were reviewed along with peer-reviewed studies that have been conducted and published since the development of the criteria document values. Of the studies considered, a study by Dansereau et al. (1999), a two-generation study in which mink were fed a range of doses of total mercury in their contaminated fish-based diet, included the lowest LOAEL. Mortalities occurred in 11 month old G1 and G2 females fed the 1.0 mg/kg mercury diet after 90 days and 330 days of exposure, respectively. No mortality was observed in the 0.5 mg/kg exposure group. Converting this dietary concentration using an ingestion rate of 0.15 kg/day and a body weight of 1 kg (USEPA 1995), the LOAEL

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<sup>&</sup>lt;sup>2</sup> Dose calculated from the LOAEL of 0.26 mg/kg ww in diet using a food ingestion rate for kestrel from USEPA (1993) of 0.31 kg/kg BW-d.

<sup>&</sup>lt;sup>3</sup> Dose calculated from the dietary concentrations using a food ingestion rate and body weight for ibises taken from Kushlan (1977a,b).

<sup>&</sup>lt;sup>4</sup> Dose calculated from the LOAEL of 0.5 mg/kg ww in diet using an estimated food ingestion rate from the low dose group of 17 percent body weight (range in study was 6 to 27 percent).



Development of Toxicity Reference Values for Birds and Mammals

dose is 0.15 mg/kg BW-d. This study also provided a corresponding NOAEL of 0.075 mg/kg BW-d. These values are selected as the mammalian dietary TRVs for the SERA.

#### 4. Other Metal Dietary TRVs

This section describes the selection and development of dietary TRVs for barium, chromium, cobalt, lead, manganese, nickel, and vanadium. As described in Section 1, the USEPA EcoSSL guidance was the primary source used to obtain TRVs for these metals (with the exception of the barium avian TRVs). Because the USEPA EcoSSL guidance (2005 and 2007) provides only NOAEL-based TRVs, in cases where the EcoSSL was the basis for a TRV, it was necessary to develop a LOAEL from the underlying data. LOAEL-based TRVs were developed as follows:

- When a bounded NOAEL-based TRV was recommended (i.e., the same study included a LOAEL for that endpoint) the LOAEL from that study was selected. For mammals this was the case for lead and nickel; for birds, lead and vanadium.
- When the recommended NOAEL-based TRV was unbounded, the lowest reproduction, growth, and survival LOAEL greater than the NOAEL-based TRV was selected. For mammals, this was the case for vanadium.
- When the recommended NOAEL-based TRV was a geometric mean of the reproduction and growth NOAELs, the lowest reproduction, growth, and survival LOAEL greater than the NOAEL-based TRV was selected. For mammals, this was the case for barium, chromium, cobalt, and manganese; for birds this was the case for chromium, cobalt, manganese, and nickel.

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**Tables** 

## Table C-1 Summary of Avian and Mammalian Toxicity Reference Values

#### Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix C - Development of Toxicity Reference Values for Birds and Mammals Anniston PCB Site, Anniston, Alabama

	Wildlife Toxicity Reference Values (mg/kg BW-d)												
COPC			Birds	Mammals									
	NOAEL TRV	LOAEL TRV	Reference	NOAEL TRV	LOAEL TRV	Reference							
tPCB (mid-range sensitivity)	0.47	1.4	Koval et al 1987; NOAEL extrapolated	0.23	0.68	McCoy et al. 1995							
tPCB (high sensitivity)	0.043	0.13	Lillie et al. 1974; NOAEL extrapolated	NA	NA	NA							
Barium	20.8	41.7	Sample et al. 1996 <sup>1</sup>	51.8	121	USEPA 2005a							
Chromium	2.66	2.8	USEPA 2008	2.40	2.8	USEPA 2008							
Cobalt	7.61	7.8	USEPA 2005b	7.33	10	USEPA 2005b							
Lead	1.63	3.26	USEPA 2005c	4.70	8.90	USEPA 2005c							
Manganese	179	348	USEPA 2007a	51.5	65	USEPA 2007a							
Mercury	0.023	0.068	Spalding et al. 2000; NOAEL extraploated	0.075	0.15	Dansereau et al. 1999							
Nickel	6.71	8.2	USEPA 2007b	1.70	3.40	USEPA 2007b							
Vanadium	0.34	0.70	USEPA 2005d	4.16	8.31	USEPA 2005d							

#### Footnotes:

#### **Acronyms and Abbreviations:**

COPC = contaminant of potential concern

NA = not applicable

NOAEL = lowest observed adverse effect level

MOAEL = no observed adverse effect level

mg/kg BW-d = milligrams per kilogram of body weight per day

OU = Operable Unit

tPCB = total polychlorinated biphenyl

TRV = toxicity reference value

OU = Operable Unit

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<sup>&</sup>lt;sup>1</sup> See Appendix C for details on development of specific TRVs.

<sup>&</sup>lt;sup>2</sup> LOAELs selected from USEPA Eco SSL datasets were selected as the lowest LOAEL in the dataset for reproduction, growth or survival that was above the selected NOAEL. Values were used as presented in the Eco SSL dataset. Specific underlying studies were note reviewed.

## Table C-2 Summary of Chicken PCB Toxicity Data Considered for Toxicity Reference Value Development

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix C - Development of Toxicity Reference Values for Birds and Mammals Anniston PCB Site. Anniston. Alabama

				Exposure			Re	sults					
		Chemical										NOAEL	LOAEL
		Form			Exposure	Duration			Study	Study		(mg/kg	(mg/kg
Study #	Reference	(Aroclor)	Dose	Dose Units 1	Duration	Units	Effect Group	Endpoint	NOAEL	LOAEL	Study Units	BW-d)	BW-d)
1	Briggs and Harris 1973	1242	20 and 50	mg/kg in food	6	weeks	reproduction	egg hatchability		20	mg/kg in food		1.3
2	Britton and Huston 1973	1242	5, 10, 20, 40, 80	mg/kg in food	12	weeks	reproduction	egg hatchability	5	10	mg/kg in food	0.32	0.65
3	Harris et al. 1976	1232	5, 10, 20	mg/kg in food	8	weeks	reproduction	egg hatchability		10	mg/kg in food		0.65
3	Harris et al. 1976	1242	5, 10, 20	mg/kg in food	8	weeks	reproduction	egg hatchability		10	mg/kg in food		0.65
3	Harris et al. 1976	1248	5, 10, 20	mg/kg in food	8	weeks	reproduction	egg hatchability		10	mg/kg in food		0.65
3	Harris et al. 1976	1254	5, 10, 20	mg/kg in food	8	weeks	reproduction	egg hatchability	5		mg/kg in food	0.32	
3	Harris et al. 1976	1016	5, 10, 20	mg/kg in food	8	weeks	reproduction	egg hatchability	5		mg/kg in food	0.32	
4	Lillie et al. 1974	1242	2 and 20	mg/kg in food	63	days	reproduction	egg hatchability	2	20	mg/kg in food	0.13	1.3
4	Lillie et al. 1974	1248	2 and 20	mg/kg in food	63	days	growth	chick growth		2	mg/kg in food		0.13
4	Lillie et al. 1974	1254	2 and 20	mg/kg in food	63	days	growth	chick growth		2	mg/kg in food		0.13
4	Lillie et al. 1974	1268	2 and 20	mg/kg in food	63	days	reproduction	egg production		20	mg/kg in food		1.3
4	Lillie et al. 1974	1221	2 and 20	mg/kg in food	63	days	growth	chick growth	20		mg/kg in food	1.3	
4	Lillie et al. 1974	1232	2 and 20	mg/kg in food	63	days	growth	chick growth		20	mg/kg in food		1.3
5	Lillie et al. 1975	1232	5, 10 and 20	mg/kg in food	16	weeks	reproduction	egg hatchability	5	10	mg/kg in food	0.32	0.65
5	Lillie et al. 1975	1016	5, 10 and 20	mg/kg in food	16	weeks	growth	chick growth	20		mg/kg in food	1.3	
5	Lillie et al. 1975	1242	5, 10 and 20	mg/kg in food	16	weeks	reproduction	egg hatchability	5	10	mg/kg in food	0.32	0.65
5	Lillie et al. 1975	1248	5, 10 and 20	mg/kg in food	16	weeks	reproduction	egg hatchability	5	10	mg/kg in food	0.32	0.65
5	Lillie et al. 1975	1254	5, 10 and 20	mg/kg in food	16	weeks	growth	chick growth	20		mg/kg in food	1.3	
6	Platanow and Reinhart 1973	1254	5 and 50	mg/kg in food	39	weeks	reproduction	egg production		5	mg/kg in food		0.32
6	Platanow and Reinhart 1973	1254	5 and 50	mg/kg in food	39	weeks	reproduction	egg hatchability		5	mg/kg in food		0.32
7	Scott 1977	1248	0.5, 1, 10 and 20	mg/kg in food	8	weeks	reproduction	egg production		20	mg/kg in food		1.3
7	Scott 1977	1248	0.5, 1, 10 and 20	mg/kg in food	8	weeks	reproduction	egg hatchability	1	10	mg/kg in food	0.065	0.65
8	Tumasonis et al. 1973	1254	50	mg/L in water	20	weeks	reproduction	egg hatchability		50	mg/L in water		3.2

#### **General Notes:**

Life stage for all test organisms is mature.

Dose conversion: Body weight for all test organisms was 1.95 kg, ingestion rates were 0.126 kg/day and 0.06 kg/kg BW-d.

#### Footnotes:

#### Acronyms and Abbreviations:

kg = kilogram(s)

kg/kg BW-d = kilograms per kilogram body weight per day LOAEL = lowest-observed adverse effects level

mg/kg = milligrams per kilogram mg/kg BW-d = milligrams per kilogram of body weight per day mg/L = milligrams per liter NOAEL = no-observed adverse effects level OU = Operable Unit PCB = polychlorinated biphenyl

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<sup>&</sup>lt;sup>1</sup> When wet or dry weight was not specified in study, diet doses were assumed to be wet weight.

#### Table C-3

#### Summary of Non-Chicken Avian Dietary PCB Toxicity Data Considered for Toxicity Reference Value Development

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix C - Development of Toxicity Reference Values for Birds and Mammals Anniston PCB Site, Anniston, Alabama

	Exposure										Effects						ose Conver	Box	sults			
					EX	Josure								Effects				Body	Ingestion	Ingestion	NOAEL	LOAEL
		Chemical Form				Route of	Exposure	Duration		Age	Life				Study	Study		Weight	Rate	Rate	(mg/kg	(mg/kg
Study #	Reference	(Aroclor)	Test Organism	Dose	Dose Units 1	Exposure	Duration	Units	Age	Units	Stage	Sex	Effect Group	Endpoint	NOAEL	LOAEL	Study Units	(kg)	(kg/day)	(kg/kg/day)	BW-d)	BW-d)
13	Haseltine and Prouty 1980	1242	mallard	150	mg/kg diet	FD	12	weeks	NA	NA	MA	В	morphology	egg shell thickness		150	mg/kg diet	1.12	0.26	0.23		35
13	Haseltine and Prouty 1980	1242	mallard	150	mg/kg diet	FD	12	weeks	NA	NA	MA	В	morphology	gross abnormalities	150		mg/kg diet	1.12	0.26	0.23	35	
14	Lowe and Stendell 1991	1248	American kestrel	3	mg/kg diet	FD	6	months	NA	NA	MA	В	morphology	egg shell thickness		3	mg/kg diet	0.12	0.054	0.47		1.4
15	McLane and Hughes 1980	1248	screech owl	3	mg/kg diet	FD	8	weeks	NA	NA	MA	В	morphology	egg shell thickness	3		mg/kg diet	0.18	0.025	0.14	0.41	
17	Risebrough and Anderson 1975	1254	mallard	40	mg/kg dw diet	FD	4	months	1	year	MA	В	morphology	egg shell thickness	40		mg/kg dw diet	1.0	0.18	0.18	7.4	
19	Scott et al. 1975	1248	Japanese quail	20	mg/kg diet	FD	10	weeks	NA	NA	MA	F	morphology	egg breaking strength	20		mg/kg diet	0.15	0.065	0.43	8.7	
11	Dahlgren et al. 1972	1254	ring-necked pheasant	12.5 and 50	mg/week	GV	16	weeks	1	year	MA	F	growth	chick growth	50		mg/week	1.0	NA	NA	7.1	
13	Haseltine and Prouty 1980	1242	mallard	150	mg/kg diet	FD	12	weeks	NA	NA	MA	В	growth	adult female body weight		150	mg/kg diet	1.12	0.26	0.23		35
13	Haseltine and Prouty 1980	1242	mallard	150	mg/kg diet	FD	12	weeks	NA	NA	MA	В	growth	duckling growth	150		mg/kg diet	1.12	0.26	0.23	35	
14	Lowe and Stendell 1991	1248	American kestrel	3	mg/kg diet	FD	6	months	NA	NA	MA	В	growth	egg weight	3		mg/kg diet	0.12	0.054	0.47	1.4	
19	Scott et al. 1975	1248	Japanese quail	20	mg/kg diet	FD	10	weeks	NA	NA	MA	F	growth	egg weight	20		mg/kg diet	0.15	0.065	0.43	8.7	
20	Dieter 1975	1254	wild starlings	1,5,25,100	mg/kg diet	FD	49	days	NA	NA	NA	NA	Mortality	mortality	5	25	mg/kg diet	0.085	0.044	0.52	2.6	13
9	Call and Harrell 1974	1242	Japanese quail	312.5/ 5000	mg/kg diet	FD	21	days	7	week	JV	F	reproduction	egg production		313	mg/kg diet	0.15	0.065	0.43		136
9	Call and Harrell 1974	1254	Japanese quail	78.1 / 1250	mg/kg diet	FD	21	days	7	week	JV	F	reproduction	egg production		78	mg/kg diet	0.15	0.065	0.43		34
9	Call and Harrell 1974	1260	Japanese quail	62.5 / 1000	mg/kg diet	FD	21	days	7	week	JV	F	reproduction	egg production		63	mg/kg diet	0.15	0.065	0.43		27
10	Custer and Heinz 1980	1254	mallard	25	mg/kg diet	FD	1+	month	9	month	MA	В	reproduction	reproductive success	25		mg/kg diet	1	0.10	0.10	2.5	
10	Custer and Heinz 1980	1254	mallard	25	mg/kg diet	FD	1+	month	9	month	MA	В	reproduction	hatchling success	25		mg/kg diet	1	0.10	0.10	2.5	
11	Dahlgren et al. 1972	1254	ring-necked pheasant	12.5 and 50	mg/week	GV	16	weeks	1	year	MA	F	reproduction	egg production	12.5	50	mg/week	1	NA	NA	1.8	7.1
11	Dahlgren et al. 1972	1254	ring-necked pheasant	12.5 and 50	mg/week	GV	16	weeks	1	year	MA	F	reproduction	egg fertility	50		mg/week	1	NA	NA	7.1	
11	Dahlgren et al. 1972	1254	ring-necked pheasant	12.5 and 50	mg/week	GV	16	weeks	1	year	MA	F	reproduction	chick survival	12.5	50	mg/week	1	NA	NA	1.8	7.1
11	Dahlgren et al. 1972	1254	ring-necked pheasant	12.5 and 50	mg/week	GV	16	weeks	1	year	MA	F	reproduction	egg hatchability		12.5	mg/week	1	NA	NA		1.8
12	Fernie et al. 2001	1248/1254/1260	American kestrel	7	mg/kg BW-d	FD	100	days	NA	NA	MA	В	reproduction	egg production		7	mg/kg BW-d					7.0
12	Fernie et al. 2001	1248/1254/1260	American kestrel	7	mg/kg BW-d	FD	100	days	NA	NA	MA	В	reproduction	number of fledglings		7	mg/kg BW-d					7.0
13	Haseltine and Prouty 1980	1242	mallard	150	mg/kg diet	FD	12	weeks	NA	NA	MA	В	reproduction	egg fertility	150		mg/kg diet	1.12	0.26	0.23	35	
13	Haseltine and Prouty 1980	1242	mallard	150	mg/kg diet	FD	12	weeks	NA	NA	MA	В	reproduction	embryo mortality	150		mg/kg diet	1.12	0.26	0.23	35	
13	Haseltine and Prouty 1980	1242	mallard	150	mg/kg diet	FD	12	weeks	NA	NA	MA	В	reproduction	duckling survival	150		mg/kg diet	1.12	0.26	0.23	35	
14	Lowe and Stendell 1991	1248	American kestrel	3	mg/kg diet	FD	6	months	NA	NA	MA	В	reproduction	egg production	3		mg/kg diet	0.12	0.054	0.47	1.4	
15	McLane and Hughes 1980	1248	screech owl	3	mg/kg ww diet	FD	8	weeks	NA	NA	MA	В	reproduction	egg production	3		mg/kg ww diet	0.18	0.025	0.14	0.41	
15	McLane and Hughes 1980	1248	screech owl	3	mg/kg ww diet	FD	8	weeks	NA	NA	MA	В	reproduction	eggs hatched	3		mg/kg ww diet	0.18	0.025	0.14	0.41	
15	McLane and Hughes 1980	1248	screech owl	3	mg/kg ww diet	FD	8	weeks	NA	NA	MA	В	reproduction	young fledged	3		mg/kg ww diet	0.18	0.025	0.14	0.41	
16	Peakall and Peakall 1973	1254	ring dove	10	mg/kg ww diet	FD	270	days	NA	NA	MA	В	reproduction	Egg production	10		ma/ka ww diet	0.15	0.065	0.43	4.3	
16	Peakall and Peakall 1973	1254	ring dove	10	mg/kg ww diet	FD	270	days	NA	NA	MA	B	reproduction	eggs hatched		10	mg/kg ww diet	0.15	0.065	0.43		4.3
16	Peakall and Peakall 1973	1254	ring dove	10	ma/ka ww diet	FD	270	davs	NA	NA	MA	В	reproduction	voung fledged		10	mg/kg ww diet	0.15	0.065	0.43		4.3
17	Peakall et al. 1972	1254	ring dove	10	mg/kg diet	FD	270	days	NA	NA	MA	В	reproduction	egg production		10	mg/kg diet	0.15	0.065	0.43		4.3
17	Peakall et al. 1972	1254	ring dove	10	mg/kg diet	FD	270	days	NA.	NA	MA	В	reproduction	eggs hatched		10	mg/kg diet	0.15	0.065	0.43		4.3
17	Peakall et al. 1972	1254	ring dove	10	mg/kg diet	FD	270	days	NA.	NA	MA	В	reproduction	young fledged		10	ma/ka diet	0.15	0.065	0.43		4.3
18	Risebrough and Anderson 1975	1254	mallard	40	mg/kg dw diet	FD	4	months	1	year	MA	В	reproduction	egg production	40	10	mg/kg dw diet	1.0	0.003	0.43	7.4	7.0
19	Scott et al. 1975	1248	Japanese quail	20	mg/kg dw diet	FD	10	weeks	NA.	NA	MA	F	reproduction	egg production	20		mg/kg dw diet	0.15	0.065	0.43	8.7	$\vdash$
19	Scott et al. 1975	1248	Japanese quail	20	mg/kg diet	FD	10	weeks	NA NA	NA NA	MA	<del>'</del> -	reproduction	hatchability	20		mg/kg diet	0.15	0.065	0.43	8.7	$\vdash$
21	Koval et al. 1987	1254	mourning dove	10	mg/kg diet	FD	28	davs	NA NA	NA NA	MA	В	reproduction	egg production	20	10	mg/kg diet	0.108	0.005	0.43	0.7	1.4
۷1	Novai et al. 1907	1204	mounting dove	10	mg/kg diet	L LD	20	uays	INA	INA	IVIA		reproduction	egg production		10	mg/kg uiet	0.100	0.015	U. 14		1.4

#### Footnotes:

#### Acronyms and Abbreviations:

 $B = both \ sexes \\ F = females \\ kg/d = kilogram(s) \\ kg/d = kilograms \ per \ day$ 

FD = in food kg/kg/day = kilograms per kilogram per day
GV = oral gavage LOAEL = lowest-observed adverse effects level
JV = juvenile MA = mature

mg/kg = milligrams per kilogram mg/kg BW-d= milligrams per kilogram of body weight per day

dw = dry weight ww = wet weight mg = milligrams NA = not available

NOAEL = no-observed adverse effects level OU = Operable Unit PCB = polychlorinated biphenyl

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<sup>&</sup>lt;sup>1</sup> When wet or dry weight was not specified in study, diet doses were assumed to be wet weight.

## Table C-4 Summary of Non-Mink Dietary PCB Toxicity Data Considered for Toxicity Reference Value Development

# Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek Appendix C - Development of Toxicity Reference Values for Birds and Mammals Anniston PCB Site, Anniston, Alabama

	Exposure							E	Effects				Dose Convers	Results			
Reference	Chemical Form (Aroclor)	Test	Dose	Dose Units		Exposure Duration	Duration Units	Effect Group	Endpoint	Study NOAEL	Study LOAEL	Study Units	Body Weight (kg)	Ingestion Rate (kg/day)	Ingestion Rate (kg/kg/day)	NOAEL (mg/kg BW-d)	LOAEL (mg/kg BW-d)
Baker et al. 1977	1254	mouse	6.4	mg/kg BW	W	9	weeks	growth	body weight	6.4	NA	mg/kg BW	NR	NR	0.135	6.4	NA
Baker et al. 1977	1254	mouse	6.4	mg/kg BW	W	9	weeks	biochemistry	Cyp 450 and Aniline hydroxylase	NA	6.4	mg/kg BW	NR	NR	0.135	NA	6.4
Bleavins et al. 1980	1242	ferret	5,10,20,40	mg/kg diet	D	247	days	reproduction	reproductive failure	NA	20	mg/kg food	0.009	NR	0.13	NA	2.6
Bruckner et al. 1973	1242	rat	100	mg/kg BW	D-O	1	day	growth	decreased body weight	NA	100	mg/kg BW	NR	NR	NR	NA	100
Bruckner et al. 1973	1242	rat	100	mg/kg BW	D-O	1	day	biochemistry	increased liver microsomal and P450 enzymes	NA	100	mg/kg BW	NR	NR	NR	NA	100
Linder et al. 1974	1254	rat	1,5,20,100	mg/kg diet	D	274	days	reproduction	fewer pups per litter	NA	1.5	mg/kg BW-d	0.5	NR	NR	NA	1.5
Linzey 1987	1254	mouse	10	mg/kg diet	D	16	weeks	mortality	survival to weaning; fewer pups per litter; body weight	NA	10	mg/kg diet	NR	NR	0.142	NA	1.4
McCoy et al. 1995	1254	mouse	5	mg/kg diet	D	12	months	reproduction	reduced number weaned per month	NA	5	mg/kg diet	NR	NR	0.135	NA	0.68
McCoy et al. 1995	1254	mouse	5	mg/kg diet	D	12	months	growth	reduced birth and weaning weight	NA	5	mg/kg diet	NR	NR	0.135	NA	0.675
Merson and Kirkpatrick 1976	1254	mouse	200	mg/kg diet	D	60	days	reproduction	reduced number of litters	NA	200	mg/kg diet	NR	NR	0.135	NA	27
Neskovic et al. 1984	1242	rat	NR	NR	0-G	30	days	growth	NR	NA	75	mg/kg BW-d	NR	NR	NR	75	NA
Neskovic et al. 1984	1242	rat	NR	NR	O-G	30	days	biochemistry	SGOT and SGPT changes	NA	75	mg/kg BW-d	NR	NR	NR	NA	75
Spencer 1982	1254	rat	0,25,20,100,20 0,300,600,900	mg/kg diet	D	9	days	reproduction	reduced fetal survival rate per litter	200	300	mg/kg diet	0.25	0.0177/0.158	0.0708/0.0632	14	19
Spencer 1982	1254	rat	0,25,20,100,20 0,300,600,900	mg/kg diet	D	9	days	growth	decreased body weight	50	100	mg/kg diet	0.25	0.018/0.0193	0.072/0.0772	3.6	7.7
Villeneuve et al. 1971	1254	rabbit	0,1,10	mg/kg BW-d	D-O	28	days	reproduction	progeny counts/number	NA	NA	NR	2.5-3	NR	NR	10	13
Villeneuve et al. 1971	1254	rat	0,6.25,12.5,25, 50,100	mg/kg BW-d	D-O	9	days	reproduction	progeny counts/number	NA	100	mg/kg BW-d	0.175-0.200	NR	NR	100	NA
Villeneuve et al. 1971	1254	rat	0,6.25,12.5,25, 50,100	mg/kg BW-d	D-O	9	days	growth	body weight	NA	100	mg/kg BW-d	0.175-0.200	NR	NR	NA	100

#### Acronyms and Abbreviations:

D = diet kg/kg/day = kilograms per kilogram per day
D-O = dose oral LOAEL = lowest-observed adverse effect level
W = daily via water mg/kg BW = milligrams per kilogram of body weight
kg = kilogram(s) mg/kg BW-d = milligrams per kilogram of body weight per day

kg/day = kilograms per day NA = not applicable

NOAEL = no-observed adverse effects level

NR = not reported
O-G = oral gavage
OU = Operable Unit

PCB = polychlorinated biphenyl

SGOT = Serum glutamic oxaloacetic transaminase SGPT = serum glutamic pyruvic transaminase

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## Appendix D

Site-Specific Risk-Based Concentrations for Dioxin Toxic Equivalents (TEQs) in Sediment, and Screening Assessment for the OU-1/OU-2 Portion of Snow Creek



## Appendix D

Site-Specific Risk-Based Concentrations for Dioxin Toxic Equivalents (TEQs) in Sediment, and Screening Assessment for the OU-1/OU-2 Portion of Snow Creek

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## **Appendix D**

Site-Specific Risk-Based Concentrations for Dioxin Toxic Equivalents (TEQs) in Sediment, and Screening Assessment for the OU-1/OU-2 Portion of Snow Creek



## E<sup>x</sup>ponent<sup>\*</sup>

## **Appendix D**

Site-Specific Risk-Based Concentrations for Dioxin Toxic Equivalents (TEQs) in Sediment, and Screening Assessment for the OU-1/OU-2 Portion of Snow Creek

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December 2013

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## **Acronyms and Abbreviations**

AHR aryl hydrocarbon receptor
BAF bioaccumulation factors
COPC chemical of potential concern

DLC dioxin-like compound DL-PCBs dioxin-like PCBs

HHRA human health risk assessment
LOAEL lowest-observed-adverse-effect level

ND non-detect

NOAEL no-observed-adverse-effect level

OU operable unit

PCB polychlorinated biphenyl

PCDDs polychlorinated dibenzodioxins PCDFs polychlorinated dibenzofurans PeCDF 2,3,4,7,8-pentachlorodibenzofuran

RI remedial investigation

RI/FS remedial investigation and feasibility study

RL reporting limit

SERA streamlined ecological risk assessment
SLERA screening-level ecological risk assessment
SSRBC site-specific risk based concentration

TCDD tetrachlorodibenzo-p-dioxin
TCDF 2,3,7,8-tetrachlorodibenzofuran
TEF Toxic Equivalency Factor

TEQ toxic equivalent

TRV toxicity reference value

USEPA U.S. Environmental Protection Agency

## 1 Introduction

In 2005, Solutia Inc. (Solutia), and Pharmacia LLC completed the *Screening Level Ecological Risk Assessment for Operable Units 1, 2, and 3* (OU-1/OU-2 and OU-3 SLERA; BBL 2005) at the Anniston Polychlorinated Biphenyl (PCB) Site (the Site). The SLERA determined that terrestrial exposure pathways for ecological receptors throughout OU-1/OU-2 were truncated and incomplete. Habitat throughout "was severely disturbed and dominated by mowed and maintained lands with low-habitat quality plant cover, impervious surfaces, and transportation infrastructure." Development pressure continues to be strong in OU-1/OU-2, and over time, the remaining terrestrial habitat fragments will likely be subject to increasing disturbance as more urban infrastructure is constructed. The United States Environmental Protection Agency (USEPA) approved the OU-1/OU-2 and OU-3 SLERA, with the exception of the aquatic portions of Snow Creek located within the bounds of OU-1/OU-2. The USEPA approved the SLERA for the terrestrial portion of OU-1/OU-2, based on the finding that the terrestrial habitat could not support a thriving ecological community. The approval also recognized that no additional assessment of ecological risk in the terrestrial portion of OU-1/OU-2 was required.

The aquatic habitat in the OU-1/OU-2 portion of Snow Creek between the confluence with the 11<sup>th</sup> Street Ditch and Highway 78 is disturbed and generally consists of low-quality ecological habitat. However, this portion of the Creek likely supports some ecological receptors, and complete exposure pathways exist for sediment. Therefore, the USEPA required additional investigation of the potential effects of Site-related constituents on wildlife that may frequent the Snow Creek aquatic ecosystem. For this assessment, the USEPA requested consideration of risk associated with several constituents in addition to PCBs. These other constituents include barium, chromium, cobalt, lead, manganese, mercury, nickel, and vanadium. In addition, risk from exposure to polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD or dioxin) toxic equivalents (TEQs), was to be assessed. These constituents are evaluated in the *Streamlined Ecological Risk Assessment for the OU-1/OU-2 Portion of Snow Creek* (SERA; ARCADIS 2013). This development of Site-specific risk-based concentrations (SSRBCs) for dioxin and dioxin like compounds and TEQ screening assessment for Snow Creek sediment is being conducted as part of the SERA, and is provided as an appendix to the SERA report.

Although this memorandum and the approach to addressing TEQ in the SERA is responsive to the USEPA's request to evaluate these constituents, there are no relationships between the presence of PCBs and the presence of PCDDs/PCDFs in OU-1/OU-2 sediment. The *Remedial Investigation Report* for OU-1/OU-2 (OU-1/OU-2 RI; ENVIRON 2013) evaluates chemicals of potential concern (COPCs) and reaches the conclusion that the distributions of PCBs and PCDDs/PCDFs in OU-1/OU-2 are different. Soil and sediment samples with elevated PCDD/PCDF concentrations are not collocated with the higher-PCB concentration samples. If the source of the PCDDs/PCDFs in OU-1/OU-2 was contamination from PCB mixtures, one would expect these two classes of compounds to be collocated. Rather, the distribution of PCDDs/PCDFs is more reflective of urban background. A more probable explanation for the presence of PCDDs/PCDFs is general atmospheric dispersion from multiple industrial sources

in the region (ENVIRON 2013). However, to meet the request of the USEPA, PCDDs/PCDFs and dioxin-like PCBs (DL-PCBs) are considered in this TEQ screening assessment.

## 1.1 TEQ Approach

TCDD, PCDDs/PCDFs, and certain DL-PCBs are structurally and toxicologically related halogenated aromatic hydrocarbons that have a common mechanism of action, involving binding of the chemicals to the aryl hydrocarbon receptor (AHR). The USEPA (2008) recommends that the TEQ component mixture method be used to evaluate ecological risks posed by these compounds, using TCDD as the index chemical. Therefore, PCDDs/PCDFs and DL-PCBs are evaluated as TCDD TEQs throughout this assessment. Table D-1 summarizes the sediment data for Snow Creek and provides the avian and mammalian toxic equivalency factors (TEFs) from the USEPA (USEPA 2008) and Van den Berg et al. (2006) that were used in the calculation of TEQs. TEFs are used to equate the potential toxicity of each PCDD/PCDF and DL-PCB congener based on their potency relative to TCDD. The concentration of each congener is multiplied by its TEF, resulting in a TCDD toxic equivalent concentration (i.e., the TEQ). TEQ values for each of the congeners are then summed to derive a total TEQ for each sample.

At the request of the USEPA, DL-PCBs were included in the TEQ assessment, even though there is a substantial amount of uncertainty regarding the use of the TEQ methodology for PCBs; this is particularly true when assessing risks to ecological receptors (Moore et al. 2012). The TEQ approach also places a significant weight on three PCB congeners—PCB-126, PCB-81, and PCB-77—with high avian TEF values (0.1, 0.1, and 0.05, respectively). However, these congeners were not detected in sediment samples collected from OU-1/OU-2, although detection limits were elevated for sample S-MED-1 (Table D-1). While the technical approach used by the USEPA in the human health risk assessment (HHRA; CDM 2010b) assumed these congeners to be absent from sediment at OU-1/OU-2 (CDM 2010a), they are included in this memorandum. In addition, PCBs were detected in sediment samples collected from locations upstream of the Site, indicating an upstream source for these compounds (ENVIRON 2013). While exposure to PCBs is already being assessed as part of the SERA, the USEPA requested that the TEQs for the derivation of the SSRBCs be calculated both with and without the inclusion of PCB congeners. This is addressed in Section 4, the Snow Creek Sediment Risk Screening, and is shown in Table D-1.

## 1.2 Document Organization

Consistent with the streamlined nature of the SERA, the potential ecological risks posed by PCDDs/PCDFs in Snow Creek sediment are evaluated in this memorandum via a screening assessment that uses a TEQ approach. Using this approach, SSRBCs were derived for TEQs and compared to Site sediment TEQ concentrations to assess risk to ecological receptors, and to provide important information to risk managers regarding the need for further ecological investigation at the Site. This assessment includes:

- Review of the literature to derive appropriate TEQ-based toxicity reference values (TRVs) for representative ecological receptors (i.e., birds and mammals) (Section 2)
- Derivation of SSRBCs for representative receptor species (Section 3)
- Screening of Snow Creek sediment data to assess risk to ecological receptors from exposure to dioxin-like compounds (DLCs) (Section 4)
- An analysis of the uncertainties associated with this procedure (Section 5)
- References cited (Section 6).

## 2 Derivation of Avian and Mammalian TRVs

Food-web modeling and TRVs from the scientific literature were used to calculate SSRBCs for TEQs that would be protective of ecological receptors potentially exposed to sediment at Snow Creek (refer to Section 3, Calculation of Site-Specific Risk-Based Concentrations). Ecological receptors and exposure parameters (e.g., food ingestion rates, body weights) used in this procedure are summarized in the SERA (ARCADIS 2013) and are reproduced in Tables D-2 and D-3, for birds and mammals, respectively. The same wildlife receptors as those evaluated in the SERA were evaluated in this TEQ screening assessment; these receptors include several trophic levels and multiple species, including benthic organisms, three mammals (muskrat, little brown bat, and the raccoon), and four bird species (mallard, tree swallow, spotted sandpiper, and pied-billed grebe).

## 2.1 Avian Dietary TRV for Dioxin-Like Compounds

To derive the TRV, the literature was reviewed for studies that investigated the effects of dioxin (as TCDD or on a TEQ basis) on avian species. The most relevant studies are summarized below.

### 2.1.1 Tittabawassee River Study (Fredricks et al. 2011)

Fredricks et al. (2011) studied tree swallows exposed to TCDD along the Tittabawassee River near Midland, Michigan. They observed that hatching success and overall productivity through fledging stage were not statistically different between TCDD-containing sites and reference areas. These investigators used a ring-necked pheasant intraperitoneal injection study (Nosek et al. 1992) as the basis for the dietary TRV for TCDD in their assessment. The dietary TRVs from the Nosek et al. (1992) study were 140 nanograms of TCDD per kilogram body weight per day (ng/kg bw-d) for the lowest-observed-adverse-effect level (LOAEL), and 14 ng/kg bw-d for the no-observed-adverse-effect level (NOAEL) for the endpoints of fertility and hatching success. The Fredricks et al. (2011) study suggested that these were conservative TRVs, due to the method of exposure and the likely greater sensitivity of pheasants compared to tree swallows.

Fredricks et al. (2011) determined food-web-based TCDD doses (34 to 630 ng/kg bw-d calculated from measured invertebrate residues) and bolus-based dietary doses (24 to 800 ng/kg bw-d). These estimated doses were greater than the NOAEL TRV from the Nosek et al. (1992) study (14 ng/kg bw-d). The maximum dietary TCDD doses (630 ng/kg bw-d from food web, and 800 ng/kg bw-d from bolus) were also greater than the LOAEL TRV (140 ng/kg bw-d). Reference-area dietary exposures were lower than both TRVs. This suggests that 800 ng TCDD/kg bw-d would be an unbounded dietary NOAEL for tree swallow hatching success and productivity at the Tittabawassee River, because, despite exceeding the TRV from the Nosek et al. (1992) study, no adverse effects were observed at these exposures. This also reinforces the notion that the TRV derived from the Nosek et al. (1992) pheasant study is likely overly conservative.

#### 2.1.2 Woonasquatucket River Study (Custer et al. 2005)

In a field study at the Woonasquatucket River, Rhode Island, by Custer et al. (2005), a reduction in tree swallow hatching success was observed at estimated doses ranging from 61 to 190 ng TEQ/kg bw-d (concentrations in diet were 72 to 230 ng TEQ/kg diet, average 136.5 ng TEQ/kg wet weight [ww]). The authors reported that approximately 90% of the TEQ was due to the presence of 2,3,7,8-TCDD. Tree swallows from the Lyman pond at this site, with an average dietary concentration of 119.5 ng TEQ/kg ww, exhibited a reduction in hatching success (70% of eggs hatched), but it was not statistically different from the reference location (77%). Likewise, nestling periods were not statistically different between swallows at Lyman (100%) and the reference location (89%). A concentration of 119.5 ng TEQ/kg ww is the lowest dietary NOAEL observed for tree swallows in this study.

A dose-based TRV was calculated using these data from the Custer et al. (2005) study. Assuming that the moisture content of invertebrate prey is 80%, a dietary concentration of 597 ng TEQ/kg dry weight [dw] was calculated. Using the tree swallow ingestion rate of 0.24 kg food/kg bw-d (refer to Table D-2), a NOAEL-based TRV of 143.4 ng TEQ/kg bw-d was derived.

#### 2.1.3 Avian NOAEL-Based TRV

The literature on the effects of TCDD on birds from field studies is inconsistent; some studies show no effects at relatively high concentrations of TCDD in diet, while others show effects at lower levels of exposure. In the Tittabawassee River study by Fredricks et al. (2011) described above, no adverse effects on tree swallow hatching success or productivity were observed at dietary doses as high as 800 ng TCDD/kg bw-d, whereas the study by Custer et al. (2005) on the Woonasquatucket River showed that adverse effects on hatching success were observed at dietary doses estimated as low as 190 ng TEQ/kg-d (Fredricks et al. 2011).

The study by Custer et al. (2005) was selected as the basis of the NOAEL-based avian TRV (143.4 ng TEQ/kg bw-d), for the following reasons:

- The evaluation looked at sensitive and population-relevant endpoints: hatching success and fledging.
- The study was conducted on tree swallows, the species that was selected for inclusion as a representative receptor in the Snow Creek SERA.
- The authors reported that nearly 97% of the TEQ in tree swallow eggs and nestling carcass samples was from a single congener—2,3,7,8-TCDD. Thus, this study is specific to the single congener used as the standard for the TEQ method (USEPA 2008).
- The data from Fredricks et al. (2011) suggested that the results of the Nosek et al. (1992) study, which was the basis of the TRV in their Tittabawassee River study, were uncertain or overly conservative, at least for the assessment of tree swallows.

Because the NOAEL derived from the Custer et al. (2005) study (143.4 ng TEQ/kg bw-d) is lower than the NOAEL derived from the results of the study by Fredricks et al. (2011) (800 ng TCDD/kg bw-d), the 143.4-ng TEQ/kg bw-d TRV can be considered adequately protective.

Similar to mammalian species, most, if not all, biochemical and toxic effects of TCDD and other DLCs in birds are thought to be mediated by the AHR. Data show a link between the adverse effects and a mode of action in which binding and activation of the AHR is the critical initiating event (Denison et al. 2011; Okey 2007). Farmahin et al. (2012a) recently reported that the sensitivity of avian species to the toxic effects of DLCs varies up to 1000-fold among species. Further, their research and that conducted by others (e.g., Head et al. 2008; Karchner et al. 2006) suggests that this variability has been associated with inter-species differences in the AHR 1 ligand binding domain (AHR1 LBD) sequence.

Farmahin et al. (2012b) studied the AHR1 LBD sequences of 86 avian species, and differences were identified. The authors classified birds into three major types based on their sensitivity to the toxic and biochemical effects of DLCs: chicken-like or Group 1 (most sensitive), pheasant-like or Group 2 (intermediate sensitivity, 6-fold lower than Group 1), and quail-like or Group 3 (least sensitive, 35-fold less sensitive than Group 1).

Of the four avian species selected for evaluation in the OU-1/OU-2 SERA (mallard, tree swallow, spotted sandpiper, and pied-billed grebe), three were evaluated in the Farmahin et al. (2012b) study—spotted sandpiper, tree swallow, and mallard. The spotted sandpiper and tree swallow were placed in Group 2 (intermediate sensitivity), while the mallard was assigned to Group 3 (least sensitive). Although pied-billed grebe was not a species included in the Farmahin et al. (2012b) study, Hackett et al. (2008) published a phylogenomic analysis of various bird species using multiple genes as markers. In this report, the authors assign flamingo as a close phylogenetic relative of grebes, based on molecular and genetic studies. The flamingo was also not evaluated by Farmahin et al. (2012b), but close relatives of this species were classified as Group 3 (least sensitive). This suggests that the Custer et al. (2005) study provides an appropriately protective TRV for Group 2 species, including the tree swallow and spotted sandpiper, but may overstate risks to Group 3 birds in the assessment—the mallard and possibly the pied-billed grebe.

## 2.2 Mammalian Dietary TRV for Dioxin-Like Compounds

As with avian species, the literature was reviewed for studies that evaluated the effects of dioxin (on a TCDD or TEQ basis) on mammals for the derivation of the mammalian TRV.

Previous studies of individual PCDD and PCDF congeners or their mixtures have demonstrated that mink are among the more sensitive mammalian species tested, with reported effects on reproduction, development, and morphological lesions of the jaw (Bursian et al. 2006; Heaton et al. 1995; Restum et al. 1998). Studies on the mink jaw lesion suggest that this endpoint is considered the best sentinel for adverse effects in mink populations (Ellick et al. 2013; Zwiernik et al. 2009). However, from a population-impact perspective, adverse effects on reproduction and development are considered the more appropriate assessment endpoints. Mink are typically

encountered in riparian ecosystems, and studies with mink are environmentally more relevant than those conducted on laboratory species such as mice or rats (e.g., Murray et al. 1979; DeVito et al. 1997), especially with compounds such as PCDDs/PCDFs, which exhibit a high degree of variability in species sensitivity. While mink are unlikely to be found along Snow Creek due to habitat constraints, this species provides a conservative basis for the less sensitive mammals that are being evaluated at the site: muskrat, little brown bat, and raccoon.

As discussed previously, in choosing the study for development of the TRV, one of the primary criteria is that the animals were not co-exposed to PCBs, particularly PCB-126. A recent high-quality study by Moore et al. (2012) satisfies this principle and was selected as the basis for the mammalian TRV.

Moore et al. (2012) investigated the effect of 3 congeners: TCDD, 2,3,4,7,8-pentachlorodibenzofuran (PeCDF), and 2,3,7,8-tetrachlorodibenzofuran (TCDF) on mink reproductive success and offspring viability and growth. Nine adult female mink were assigned randomly to one of 13 dietary treatments: one control and four doses each of TCDD, PeCDF, and TCDF (2.1–8.4, 4.0–15, and 5.2–25 ng TEQ/kg bw-d, respectively). The mink were exposed from two months prior to breeding through weaning of offspring at six weeks of age. At least nine kits per treatment group were maintained on these diets through 27 weeks of age. No effects on litter size or viability of offspring were observed at any of these treatment levels. In addition, consistent effects on body mass or relative organ masses were not observed in animals at any age. Therefore, this recent study by Moore et al. provides an unbounded NOAEL of 25 ng TEQ/kg bw-d, the highest dose at which no effects were observed.

Similarly, Zwiernik et al. (2009) exposed mink to 2,3,7,8-TCDF in diet up to 240 ng TEQ/kg www. These authors reported that dietary doses as high as 30 ng TEQ/kg bw-d did not affect reproduction and kit viability, although body masses of offspring through 36 weeks of age were decreased compared with controls at various time points in the experiment.

The study by Moore et al. (2012) was selected as the basis for the derivation of the mammalian TRV (25 ng TEQ/kg bw-d), for the following reasons:

- The study evaluated sensitive and population-relevant endpoints: litter size and viability of offspring.
- Mink are likely more sensitive to the effects of PCDDs/PCDFs than are the
  representative mammalian receptors identified in the Snow Creek SERA:
  muskrat, little brown bat, and raccoon. Therefore, the TRV should be
  adequately protective of these species.
- Mink were exposed only to constituents that are the focus of this assessment: TCDD and PCDDs/PCDFs.
- The NOAEL-based TRV is supported by the results of the study by Zwiernik et al. (2009), in which exposure to doses in diet up to 30 ng TEQ/kg bw-d did not affect mink reproduction and kit viability. The NOAEL from Zwiernik et al. (2009) is also supported by the review by Blankenship et al. (2008), wherein the highest diet-based LOAEL, 242 ng TEQ/kg (ww feed), is similar

to the 240 ng TEQ/kg ww reported by Zwiernik et al. (2009) where the only effects observed were on offspring weight.

# 3 Calculation of Site-Specific Risk-Based Concentrations

The SSRBCs are sediment TEQ concentrations that are derived to be protective of resident wildlife that might forage at Snow Creek. SSRBCs were derived for each ecological receptor from the TRVs presented in Section 2. The SSRBCs are compared to Site sediment TEQ concentrations in Section 4 to assess risk to resident ecological receptors.

Food-web modeling was used to develop the SSRBCs for each representative receptor. The exposure factors and dietary profiles for the avian and mammalian species used in these calculations are described in detail in Section 4.4 of the SERA, and are provided here in Tables D-2 and D-3, for birds and mammals, respectively. Likewise, bioaccumulation factors (BAFs) are summarized in Section 4.3 and Appendix A of the SERA, and are repeated in Table D-4. Because the environmental transport through the aquatic food web is not as thoroughly studied for DLCs as for PCBs, the BAFs for PCBs used in the SERA were adopted for use in deriving the SSRBCs.

At the request of the USEPA, BAFs for PCBs were developed using two different approaches: 1) use of field data collected in Snow Creek; and 2) use of data collected as part of the sediment toxicity studies conducted for OU-4. While the first approach resulted in a single value for use in the bioaccumulation models, the latter method involved developing a linear regression for accumulation in worms relative to sediment concentrations of Aroclors. However, this approach was not appropriate for the estimation of accumulation of dioxin-like compounds, including PCBs, for several reasons. First, the data set used for the OU-4 laboratory bioaccumulation program did not contain PCDDs or PCDFs, and thus, there was no way of knowing whether the linear relationship derived for "Aroclors" was appropriate for these other compounds. Second, the concentrations of Aroclors in sediment used to derive the regression were significantly higher than the TEQ concentrations measured in Snow Creek sediments. Therefore, the derivation of the TEQ SSRBC relied on the BAF from Snow Creek field data.

The assessment endpoints that are relevant to the development of the SSRBCs for TEQ are similar to those described for PCBs—that is, the survival, growth, and reproduction of resident birds and mammals. Reproduction and development of young are considered the most sensitive endpoints that are relevant to population-level effects; therefore, the TRVs and, subsequently, the SSRBCs were derived from studies that assessed these effects.

Food-web modeling was used to calculate the SSRBCs using a target hazard of 1 and the TRVs derived in Section 2. The formula to calculate the SSRBCs for TEQ in sediment is:

$$\frac{\text{TH x TRV}}{\text{IR x } [(\text{CD}_i \text{ x BAF}_i) + (\text{CD}_2 \text{ x BAF}_2) + \cdots (\text{CD}_i \text{ x BAF}_i)]}$$

#### where:

TH Target hazard (unitless)

TRV Toxicity reference value (ng/kg bw-d)

IR Ingestion rate (kg/kg bw-d)CD<sub>i</sub> Composition of diet (%)

BAF Bioaccumulation factor (unitless)

The parameters used in the calculations are provided in Tables D-5 and D-6, for birds and mammals, respectively. The results of the SSRBC calculation for each receptor identified by the USEPA as relevant to OU-1/OU-2 are presented in Table D-7. Because the target hazard equals 1 and NOAEL-based TRVs are used to derive the SSRBCs, these values represent "safe" sediment concentrations to which the receptors could be exposed with no risk of adverse effects.

## 4 Snow Creek Sediment Risk Screening

The species-specific SSRBCs derived in Section 3 and presented in Table D-7 were used to evaluate the risks to resident wildlife receptors using sediment data from samples collected from Snow Creek. If TEQ concentrations in Snow Creek sediment are less than the SSRBCs, then risk to birds and mammals can be concluded to be negligible from exposure to DLCs in Snow Creek.

Avian and mammalian TEFs from the USEPA (USEPA 2008) and Van den Berg et al. (2006) were used to calculate TEQ concentrations for the Snow Creek sediment data. Data are available for two sediment samples in Snow Creek (Table D-1). These samples were part of a larger 2006 sampling effort conducted to support the OU-1/OU-2 remedial investigation/feasibility study (RI/FS). The sampling locations are described in the *Preliminary Site Characterization Summary Report for OU-1/OU-2* (ARCADIS BBL 2007). Sediment TEQ concentrations were calculated using these data for PCDDs/PCDFs and also for DL-PCB congeners. Total TEQs (PCDD/PCDFs + PCBs) were also calculated for each sample. The resulting sediment TEQ concentrations are reported in Table D-1.

Because several congeners were not detected in the sediment samples, a potential area of uncertainty associated with the TEQ calculation is the manner in which the samples with non-detected (ND) values are handled in developing TEQ concentrations. For example, nine of the fifteen (60%) PCDD/PCDF congeners on the analyte list were not detected in Snow Creek sample S-MED-1, and eight of the twelve individual PCB congeners were not detected in any of the samples. How these ND concentrations are handled can substantially affect the analysis of the data. An appropriate approach to address this issue of ND values for risk assessment purposes is to derive bounding estimates of the TEQ concentration (USEPA 2002). This method involves determining the lower and upper bounds based on the full range of possible values for NDs: 1) assuming that all of the ND concentrations are zero; and 2) assuming that the ND analytes are present at the detection or reporting limit (RL) and, at the recommendation of the USEPA, at 0.5 RL for PCBs. The following is a summary of Snow Creek sediment TEQ concentrations calculated using each of these scenarios and TEFs for mammals and birds (from Table D-1):

Total PCDD/PCDF TEQ, mammalian:

• When ND = 0, range: 1.9–36 ng/kg

• When ND = RL, range: 7.6-70 ng/kg

Total TEQ including PCBs (PCDDs/PCDFs + PCBs), mammalian:

• When ND = 0, range: 5.4–179

• When ND = RL for PCDDs/PCDFs and 0.5 RL for PCBs, range: 286–11,337 ng/kg

## Total PCDD/PCDF TEQ, avian:

• When ND = 0, range: 9-94 ng/kg

• When ND = RL, range: 18-244 ng/kg

Total TEQ including PCBs (PCDDs/PCDFs + PCBs), avian:

• When ND = 0, range: 14-337 ng/kg

• When ND = RL for PCDDs/PCDFs and 0.5 RL for PCBs, range: 760.3–30,343 ng/kg

Although only two stations were sampled along the 4 miles of creek, they do provide sufficient information to assess a range of PCBs concentrations and their impact on the calculated TEQ.

- The levels of PCDDs/PCDFs and PCB congeners are generally low, with many—and in some cases, most—of the congeners below the analytical detection limit (ND).
- The maximum TEQ for PCDDs/PCDFs calculated using the mammalian TEFs (70 ng/kg, assuming ND = RL from Table D-1) is greater than the lowest SSRBC for mammals (37 ng/kg derived for the little brown bat, Table D-7), but would represent an HQ of only approximately 2.
- The maximum TEQ for PCDDs/PCDFs calculated using the avian TEFs (244 ng/kg, assuming ND = RL from Table D-1) is higher than the lowest SSRBC for birds (156 ng/kg derived for the tree swallow, Table D-7), but the HQ is still lower than 2.

As discussed previously, a high degree of uncertainty is associated with including the DL-PCB congeners in the TEQ estimate. This uncertainty is driven by including one half of the laboratory reporting limit concentration for these compounds (PCB-126, PCB-81, and PCB-77) when these congeners were not detected in Snow Creek sediment; and the high TEFs for these three specific PCB congeners. The uncertainty is underscored for sample S-MED-1, for which the sample-specific reporting limits are two orders of magnitude greater than the other sample results (Table D-1). Using one half of the sample-specific reporting limit significantly increases the total TEQ values (inclusive of PCDD/PCDF and DL-PCBs) despite the most important congeners (PCB-126, PCB-81, and PCB-177) not being detected by the laboratory. The calculated TEQ values (TEQ for PCDD/PCDF and TEQ for PCDD/PCDF and DL-PCBs) are presented in Table D-1. Including these non-detect values, even at one-half the reporting limit, would artificially inflate the "total TEQ" concentration and would not provide any useful information on the risks to wildlife from exposure to these compounds in Snow Creek Sediments. Therefore, this total TEQ analysis was not included as part of this assessment.

## 5 Uncertainty Analysis

As with any risk assessment, some degree of uncertainty is inherent in the assumptions and calculations. Several areas of uncertainty described in the SERA (SERA Section 6.3) are relevant to this assessment. Below are several of the more significant areas that contribute to the uncertainty associated with the derivation of the SSRBCs.

- 1. Relying on highly conservative TRVs for mammalian receptors. The TRV for mammalian species was derived from studies on mink. Mink are acknowledged to be uniquely and highly sensitive to the adverse effects of DLCs. Applying this TRV to all mammalian receptors evaluated in the assessment is very conservative and likely to overstate risk. Recent studies with avian species using advanced technology provide information on the relative sensitivity of various species of birds to the toxic effects of DLCs (refer to Section 2). However, similar studies are not available to assess the relative sensitivity of mammals. Therefore, it is not possible to assess the relative sensitivity of species such as the raccoon or muskrat, and the magnitude of the conservative nature of the mammalian risk-based TEQ concentration cannot be quantified.
- 2. Assuming that 100% of wildlife diet is made up of prey originating from Snow Creek. As described in detail in the SLERA (BBL 2005), both the aquatic and terrestrial habitat throughout much of Snow Creek is poor. Data provided in the SLERA indicate that the aquatic ecosystem of Snow Creek is unproductive throughout large portions of the creek. Therefore, it is unlikely that Snow Creek is sufficiently productive to support significant populations of birds and mammals. Those individuals that might visit Snow Creek would likely forage in other areas in addition to Snow Creek to support their dietary needs. Assuming that 100% of the receptors' diet originates from Snow Creek is highly conservative and is likely to overstate risk.
- 3. Assuming that a *population* of a given receptor species can be adversely affected by exposure to DLCs in Snow Creek sediment. As mentioned previously, because of the poor habitat provided by Snow Creek, including the patchy nature of the few areas of reasonably marginal habitat, and also due to the inaccessibility of the creek from development along its floodplain, few if any individuals from these species could be exposed in the manner assumed in this assessment (e.g., 100% of diet obtained from Snow Creek). Therefore, population-level effects are unlikely and risks would be overstated.
- 4. <u>Using TRVs derived from field studies</u>. Use of a TRV derived from a field study actually reduces the uncertainty associated with extrapolating administered dose (diet) to internal dose. For example, in the case of the avian TRV, if the oral absorption efficiency of DLCs in prey items from the Woonasquatucket River is assumed to be the same as that in prey from Snow

Creek, there would be no uncertainty in the extrapolation of doses. Therefore, there is an advantage to using field-derived TRVs versus those derived from laboratory studies that employ injection or oral gavage as the exposure route. This reduces the uncertainty associated with the derivation of the TRVs and the SSRBCs, and therefore would more accurately reflect actual risks.

5. Including dioxin-like PCB congeners in the calculation of the sediment TEQ concentrations. SSRBCs are exceeded only when the dioxin-like PCBs are included in the calculation of the TEQ. There is a high degree of uncertainty regarding the use of the TEQ method for PCBs, particularly when assessing risks to ecological receptors. The most significant PCB congeners in terms of "dioxin-like potency," and therefore significant contributors to the TEQ, are PCB-126, PCB-81, and PCB-77. These congeners were not detected in sediment at OU-1/OU-2. Furthermore, RLs for PCB congeners in sample S-MED-1 were very high. These factors contribute artificially to a high degree of uncertainty for the TEQs calculated, including the dioxin-like PCBs. For example, when 0 is used as a surrogate for ND congener concentrations, the maximum avian PCB TEQ is 243 ng/kg; using 0.5 RL the maximum avian PCB TEQ is 30,098 ng/kg (Table D-1), or more then 100times higher. Because the Snow Creek data set for OU-1/OU-2 is limited to two analytical results for these three PCB congeners, we examined the available PCB congener data for sediment from the OU-4 portion of the Site. The OU-4 sediment data set supports the limited presence of these three congeners in the aquatic portions of the Site. There were 27 sediment samples from OU-4 analyzed for these three PCB congeners, and PCB-77 and PCB-81 were not detected in any of these 27 samples. PCB congener PCB-126 was only detected in two of the 27 samples (7.4%), which further supports the general absence of this congener. The OU-4 data set further confirms the limited impact of these PCB congeners, because the average sample-specific reporting limits for these three non-detected congeners is a factor of 10 to 100 lower than the sample-specific reporting limit associated with sample S-MED-1 from the OU-1/OU-2 portion of Snow Creek. For these reasons, exceeding the SSRBCs is not considered to be a significant finding for the OU-1/OU-2 portion of Snow Creek.

The limited detection of PCB -126 is also supported by the floodplain soil data collected in OU-1/OU-2 and OU-4. PCB-126 was detected in only 12% of the floodplain soil samples (25 of 212) collected from these two OUs and analyzed for this particular congener. The analytical results for PCB-126 in the sediment samples are similar, with this congener being detected only in 15% (5 of 33) of the samples collected from these two OUs. In considering the effect of the other PCB congeners that make up the list of dioxin-like PCB congeners, the potential presence of congeners PCB-77, PCB-81, and PCB-169 is often considered. In addition to PCB-126, these other non-orthosubstituted PCB congeners have the largest effect on the calculated risk levels. The frequency of detection for these three congeners for the OU-1/OU-2 and

OU-4 data set includes PCB-77 at 9%, PCB-81 at 8%, and PCB-169 at 1%. These detection frequency percentages are based on all of the sample results, inclusive of parent and duplicate samples. This approach was necessary, because the PCB congeners were sometimes not detected in both the parent and duplicate samples. The collective frequency of detection for sediment in these two OUs includes PCB-77 at 15%, PCB-81 at 15%, and PCB-169 at 0%. While the frequency of detection of PCB-126 is higher (42%) in the 29 analyses that were conducted for sediments collected for the sediment toxicity and bioaccumulation testing program, these analyses were conducted on samples that are not representative of Site conditions and will not be used for defining the nature and extent of contamination in the yet-to-be-developed OU-4 Preliminary Site Characterization Summary Report and the OU-4 Remedial Investigation Report. These sediment samples were initially sieved in the field, re-handled and re-stored several times at the sediment toxicity testing laboratory over a 9-month period, and the same parent samples were often re-mixed and reanalyzed several times to arrive at the 29 analytical results. It is noteworthy that PCB-126 was detected only when the total PCB concentrations were elevated. Of the 11 of 26 samples in which PCB-126 was detected, nine of the samples had total PCB concentrations greater than 25 mg/kg, and two of samples had total PCB concentrations between 5 and 10 mg/kg. In any of these cases, the total PCB concentration would be the risk driver, and the potential presence of PCB-126 would not be a significant consideration. Concentrations of the other non-ortho-substituted PCB congeners (PCB-77, PCB-81, and PCB-169) were also not detected in any of the sediment samples collected for the sediment toxicity and bioaccumulation testing program.

The limited presence of PCB-126 in the Anniston area is also supported by research published in the mid-1990s (Frame et al. 1996). This research indicates that PCB congener PCB-126 was detected only in measurable concentrations in what is referred to as "late Aroclor 1254." This particular mixture was manufactured only from 1974 to 1977, and based on the PCB production dates for the Anniston facility, it was not produced in Anniston.

The lines of evidence presented above support PCB-126 not being a significant risk contributor for OU-1/OU-2 and the Site as a whole. This finding is consistent with the human health risk assessments that were prepared for OU-1/OU-2 and OU-4 by the USEPA (CDM, 2010b and JM Waller and Associates, Inc. 2013).

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# **Appendix D Tables**

Table D-1. Snow Creek sediment concentrations and TEQs

		TEF		S-LOW-1 S10136	S-MED-1 S10134	Average
PCDDs/PCDFs	Units	Mammalian	TEF Avian	0-6 in	0-8 in	
2,3,7,8-TCDD	ng/kg	1	1	1.8 U	16 UXA	
1,2,3,7,8-PeCDD		1	1	2.2 U	3 U	
	ng/kg			2.2 0	24	
1,2,3,4,6,7,8-HpCDD	ng/kg	0.01	0.001			
1,2,3,4,7,8-HxCDD	ng/kg	0.1	0.05	1.1 U	2.2 U	
1,2,3,6,7,8-HxCDD	ng/kg	0.1	0.01	1.4	2.4 U	
1,2,3,7,8,9-HxCDD	ng/kg	0.1	0.1	1 U	2.1 U	
Octa CDD	ng/kg	0.0003	0.0001	180	267	
2,3,7,8-TCDF	ng/kg	0.1	1	8.3	130 UXB	
1,2,3,7,8-PeCDF	ng/kg	0.03	0.1	4 U	13	
2,3,4,7,8-PeCDF	ng/kg	0.3	1	4.1 U	82	
1,2,3,4,6,7,8-HpCDF	ng/kg	0.01	0.01	7.4 UXA	55 UXA	
1,2,3,4,7,8,9-HpCDF	ng/kg	0.01	0.01	1.3 UXA	40.6	
1,2,3,4,7,8-HxCDF	ng/kg	0.1	0.1	3.36	73.6	
1,2,3,6,7,8-HxCDF	ng/kg	0.1	0.1	1.62	19.6	
1,2,3,7,8,9-HxCDF	ng/kg	0.1	0.1	1 U	2.7	
2,3,4,6,7,8-HxCDF	ng/kg	0.1	0.1	1.18	10.2	
Octa CDF	ng/kg	0.0003	0.0001	11.2	115	
Total PCDD/PCDF TEQ (ND = 0) Mammalian	ng/kg	-	-	1.9	36	19
Total PCDD/PCDF TEQ (ND = RL) Mammalian	ng/kg	-	-	7.6	70	39
Total PCDD/PCDF TEQ (ND = 0) Avian	ng/kg	-	-	9.0	94	52
Total PCDD/PCDF TEQ (ND = RL) Avian	ng/kg	-	-	18.0	244	131

Table D-1. Cont.

PCB Congeners	Units	TEF Mammalian	TEF Avian	S-LOW-1 S10136	S-MED-1 S10134	Averag
		Wallinalan		0-6 in	0-8 in	
BZ#77	mg/Kg	0.0001	0.05	0.0042 U	0.17 U	
BZ#81	mg/Kg	0.0003	0.1	0.0084 UJ	0.34 UJ	
BZ#105	mg/Kg	0.00003	0.0001	0.028	1.7	
BZ#114	mg/Kg	0.00003	0.0001	0.0042 U	0.17 U	
BZ#118	mg/Kg	0.00003	0.00001	0.077	2.6	
BZ#123	mg/Kg	0.00003	0.00001	0.0042 U	0.17 U	
BZ#126	mg/Kg	0.1	0.1	0.0042 U	0.17 U	
BZ#156	mg/Kg	0.00003	0.0001	0.013	0.47	
BZ#157	mg/Kg	0.00003	0.0001	0.0042 U	0.17 U	
BZ#167	mg/Kg	0.00003	0.00001	0.0084 UJ	0.34 UJ	
BZ#169	mg/Kg	0.03	0.001	0.0042 U	0.17 U	
BZ#189	mg/Kg	0.00003	0.00001	0.0042 U	0.17 U	
Total PCB TEQ (ND=0) Mammalian	ng/kg	-	-	4	143	73
Total PCB TEQ (ND=0.5*RL) Mammalian	ng/kg	-	-	278	11268	5773
Total PCB TEQ (ND=0) Avian	ng/kg	-	-	4.9	243	124
Total PCB TEQ (ND=0.5*RL) Avian	ng/kg	-	-	742	30098	15420
TEQ Summary						
Total PCDD/PCDF TEQ (ND = 0) Mammalian	ng/kg	-	-	1.9	36	19
Total PCDD/PCDF TEQ (ND = RL) Mammalian	ng/kg	-	-	7.6	70	39
Total PCDD/PCDF TEQ (ND = 0) Avian	ng/kg	-	-	9.0	94	52
Total PCDD/PCDF TEQ (ND = RL) Avian	ng/kg	-	-	18	244	131
Total PCB TEQ (ND=0) Mammalian	ng/kg	-	-	3.5	143	73
Total PCB TEQ (ND=0.5*RL) Mammalian	ng/kg	-	-	278	11268	5773
Total PCB TEQ (ND=0) Avian	ng/kg	-	-	4.9	243	124
Total PCB TEQ (ND=0.5*RL) Avian	ng/kg	-	-	742	30098	15420
Total TEQ (ND=0) Mammalian	ng/kg	-	-	5.4	179	92
Total TEQ (ND=0) Avian	ng/kg	-	-	14	337	176
Total TEQ (ND=RL[DD/DF]; 0.5 RL[PCB]) Mammalian	ng/kg	-	-	286	11337	5812
Total TEQ (ND=RL[DD/DF]; 0.5 RL[PCB]) Avian	ng/kg	-	-	760	30343	15551
Contribution of BZ#126 to Total TEQ (ND=0)	%	-	-	0	0	0
Contribution of BZ#126 to Total TEQ (ND=RL[DD/DF]; 0.5 RL [PCB]) mammalian Contribution of BZ#126 to Total TEQ	%	-	-	73	75	74
(ND=RL[DD/DF]; 0.5 RL [PCB]) Avian				28	28	28

#### Table D-1. Cont.

#### Notes:

Data are from the RI (ENVIRON 2013)

Toxic Equivalency Factors (TEFs) are from EPA (U.S. EPA 2008) and Van den Berg et al. (2006)

Total TEQ is the summation of Total Dioxin TEQ and Total PCB TEQ.

U = not detected

J = Estimated

RL = Reporting limit

UY = not detected; peak exceeds expected retention time (from internal standard)

UXA = not detected; peak does not meet ratio criteria and has resulted in an elevated detection limit

UXB = not detected, diphenylether interference present caused dibenzofuran to become a "not detected"

Table D-2. Avian receptor exposure parameters

Parameter		Aquatic Herbivore	,	Aerial-Feeding Insectivore		Aquatic Invertivore		Aquatic Omnivore	
Farameter		Mallard		Tree Swallow		Spotted Sandpiper	Pied-Billed Grebe		
Composition of Diet (%)									
Sediment	6%	Beyer et al. (1994)	0%	Assumed to be negligible based on feeding strategy.	18%	Beyer et al. (1994), average of four sandpiper values.	6%	Mallard value assumed as a surrogate.	
Aquatic Emergent and Flying Insects	0%		100%	Robertson et al. (1992)	50%		5%		
Aquatic Plants	80%	Herbivorous diet was chosen in	0%		0%		10%		
Reptiles/Amphibians	0%	order to evaluate mallard as an herbivorous receptor. Diet is based on professional judgment,	0%		0%	Diet adapted from Oring et al. (1997) using professional judgment to adjust based on food items	10%	Diet adapted from Wetmore 1924 (in Muller and Storer 1999), using professional judgment to adjust	
Benthic Invertebrates	10%	supported by Dillon 1959 (in USEPA 1993) of a plant-based	0%		50%	available within Snow Creek portion of OU-1/OU-2.	53%	based on food items available within Snow Creek portion of OU-1/OU-2.	
Crayfish	0%	mallard diet in coastal Louisiana.	0%		0%		20%	1700 2.	
Mollusk	10%		0%		0%		2%		
Body Weight (kg)	1.2	Average of non-breeding, adult birds (Drilling et al. 2002).	0.021	Robertson et al. (1992)	0.043	USEPA (1993), average of reported values.	0.42	Average of both sexes (Muller and Storer 1999).	
Food Ingestion Rate (kg/kg bw/d) (dw)	0.087	Chukwudebe et al. (1988)	0.24	Nagy (2001), allometric equation for insectivores.	0.18	Nagy (2001), allometric equation for insectivores.	0.071	Nagy (2001), allometric equation for omnivores	

#### Notes:

Exposure parameters are reproduced from SERA Table 4-2 (ARCADIS 2013)

-- = not applicable

dw = dry weight

kg = kilogram

kg/kg bw/d = kg/kg body weight per day

OU = Operable Unit

PCB = polychlorinated biphenyl

USEPA = U.S. Environmental Protection Agency

#### References:

Beyer, W.N., E. Conner, and S. Gerould. 1994. Estimates of soil ingestion by wildlife. J. Wildl. Manage. 58:375-382.

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Muller, M.J. and R.W. Storer. 1999. Pied-Billed Grebe (Podilymbus podiceps). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/410

Nagy, K.A. 2001. Food requirements of wild animals: Predictive equations for free-living mammals, reptiles, and birds. Nutrition Abstracts and Reviews, Series B, 71:21R-31R.

Oring, L.W., E.M. Gray, and J.M. Reed. 1997. Spotted sandpiper (Actitis macularius). The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/289

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USEPA. 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187. U.S. Environmental Protection Agency, Washington, DC.

Wetmore, A. 1924. Food and economic relations of North American grebes. U.S. Dep. Agr., Dep. Bull. 1196:1-23. As cited in Muller and Storer 1999.

Table D-3. Mammalian receptor exposure parameters

Parameter		Herbivore	Mar	nmalian Aerial-Feeding Insectivore		Mammalian Omnivore		
Parameter	Muskrat			Little Brown Bat	Raccoon			
Composition of Diet (%)								
Sediment	9%	Beyer et al. (1994), muskrat used as surrogate.	0%	Assumed to be negligible for aerial-feeding insectivores.	9%	Beyer et al. (1994)		
Aquatic Emergent and Flying Insects	0%		100%	Belwood and Fenton (1976), as cited in Sample and Suter (1994).	0%			
Aquatic Plants	90%		0%		44%			
Amphibian (e.g., frogs)	0%	Diet adapted from USEPA 1993, using professional judgment to	0%		10%	Diet adapted from USEPA 1993, using		
Reptile (e.g., snakes)	0%	adjust based on food items available within Snow Creek portion of OU-1/OU-2. Primarily herbivorous, but	0%		5%	professional judgment to adjust based on food items available within Snow Creek		
Aquatic Invertebrates	5%	small invertebrates taken incidentally.	0%		13%	portion of OU-1/OU-2.		
Crayfish	0%		0%		15%			
Mollusk	5%		0%		13%			
Body Weight (kg)	1.1	Average of values given in Reid (2006).	0.01	Nagy (2001), allometric equation for little brown bat.	5.6	USEPA (1993), average of adult and juvenile means values.		
Food Ingestion Rate (kg/kg bw/d) (dw)	0.07	Nagy (2001), allometric equation for Rodentia.	0.18	Nagy (2001), allometric equation for little brown bat.	0.03	Nagy (2001), allometric equation for Omnivores.		

#### Notes:

Exposure parameters are reproduced from SERA Table 4-3 (ARCADIS 2013)

-- = not applicable

dw = dry weight

kg = kilogram

kg/kg bw/d = kg/kg body weight per day

OU = Operable Unit

PCB = polychlorinated biphenyl

USEPA = U.S. Environmental Protection Agency

#### References:

Belwood, J.J. and M.B. Fenton. 1976. Variation in the diet of Myotis lucifugus (Chiroptera: Vespertilionidae). Can. J. Zool. 54:1674-1678. As cited in Sample and Suter 1994. Beyer, W.N., E. Conner, and S. Gerould. 1994. Estimates of soil ingestion by wildlife. J. Wildl. Manage. 58:375-382.

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Sample, B.E., and G.W. Suter, II. 1994. Estimating Exposure of Terrestrial Wildlife to Contaminants. ES/ER/TM-125. Oak Ridge National Laboratory, Oak Ridge TN. USEPA. 1993. Wildlife Exposure Factors Handbook. EPA/600/R-93/187. U.S. Environmental Protection Agency, Washington, DC.

Table D-4. Summary of sediment to aquatic BAFs

	Sediment to Emergent Insects	Sediment to Aquatic Plants	Sediment to/ Amphibians (e.g., frogs)	Sediment to Reptiles (e.g., snakes)	Sediment to Benthic Invertebrates	Sediment to Crayfish	Sediment to Mollusks
	$BAF_2$	BAF <sub>3</sub>	BAF <sub>4</sub>	BAF <sub>5</sub>	BAF <sub>6</sub>	BAF <sub>7</sub>	BAF <sub>8</sub>
tPCB	3.82	0.42	3.40	26.91	0.92	0.75	6.50

## Notes:

BAFs are reproduced from SERA Table 4-1 (ARCADIS 2013)

BAF = bioaccumulation factor

tPCB = total polychlorinated biphenyl

Table D-5. Parameters for the calculation of risk-based TEQ values for avian species

Symbol	Definition	Dabbling Duck	Tree Swallow	Spotted Sandpiper	Pied Billed Grebe
TH	Target Hazard (unitless)	1	1	1	1
TRV	Toxicity Reference Value (ng/kg bw-d)	143.4	143.4	143.4	143.4
IR	Ingestion Rate (kg/kg bw-d)	0.087	0.24	0.178	0.07
Cd <sub>i</sub>	Composition of Diet (%)				
CD <sub>1</sub>	Sediment (%)	6	0	18	6
$CD_2$	Emergent and Flying Insects (%)	0	100	50	5
CD <sub>3</sub>	Aquatic Plants (%)	80	0	0	10
$CD_4$	Reptiles/Amphibians (%)	0	0	0	10
CD <sub>5</sub>	Benthic Invertebrates (%)	10	0	50	53
$CD_6$	Crayfish (%)	0	0	0	20
CD <sub>7</sub>	Mollusk (%)	10	0	0	2
$BAF_i$	Bioaccumulation Factor				
BAF <sub>1</sub>	Sediment	0.3	0.3	0.3	0.3
$BAF_2$	Emergent and F lying Insects	3.82	3.82	3.82	3.82
BAF <sub>3</sub>	Aquatic Plants	0.42	0.42	0.42	0.42
BAF <sub>4</sub>	Reptiles/Amphibians	3.4	3.4	3.4	3.4
BAF <sub>5</sub>	Benthic Invertebrates	0.92	0.92	0.92	0.92
BAF <sub>6</sub>	Crayfish	0.75	0.75	0.75	0.75
BAF <sub>7</sub>	Mollusk	6.5	6.5	6.5	6.5

#### Note:

Ingestion rates and dietary proportions are from Tables 2 and 3, for birds and mammals, respectively. BAFs are from Table 4.

Table D-6. Parameters for the calculation of risk-based TEQ values for mammalian species

Symbol	Definition	Muskrat	Little Brown Bat	Raccoon
TH	Target Hazard (unitless)	1	1	1
TRV	Toxicity Reference Value (ng/kg bw-d)	25	25	25
IR	Ingestion Rate (kg/kg bw-d)	0.0682	0.178	0.03
CD <sub>i</sub>	Composition of Diet (%)			
CD <sub>1</sub>	Sediment (%)	9.4	0	9.4
$CD_2$	Emergent and Flying Insects (%)	0	100	0
$CD_3$	Aquatic Plants (%)	90	0	44
$CD_4$	Amphibians e.g., frogs (%)	0	0	10
CD <sub>5</sub>	Reptiles e.g., snakes (%)	0	0	5
CD <sub>6</sub>	Benthic Invertebrates (%)	5	0	13
CD <sub>7</sub>	Crayfish (%)	0	0	15
CD <sub>8</sub>	Mollusk (%)	5	0	13
BAF <sub>i</sub>	Bioaccumulation Factor			
BAF <sub>1</sub>	Sediment	0.3	0.3	0.3
$BAF_2$	Emergent and Flying Insects	3.82	3.82	3.82
BAF <sub>3</sub>	Aquatic Plants	0.42	0.42	0.42
BAF <sub>4</sub>	Amphibians e.g., frogs	3.4	3.4	3.4
BAF <sub>5</sub>	Reptiles e.g., snakes	26.91	26.91	26.91
BAF <sub>6</sub>	Benthic Invertebrates	0.92	0.92	0.92
BAF <sub>7</sub>	Crayfish	0.75	0.75	0.75
BAF <sub>8</sub>	Mollusk	6.5	6.5	6.5

Table D-7. Site-specific risk-based concentrations and species-specific parameters

-	SSRBC for TEQ in Sediment	Ingestion Rates	Body Weight
	(ng/kg)	(kg food/kg bw-d)	(kg)
Avian Receptors			
Dabbling duck	1,504	0.087	1.17
Tree swallow	156	0.24	0.021
Sandpiper	332	0.18	0.043
Pied-billed grebe	1,508	0.07	0.416
Mammalian Receptors			
Muskrat	472	0.068	1.1
Little brown bat	37	0.18	0.0075
Raccoon	280	0.03	5.6

## Note:

Ingestion rates and body weights are from Tables D-2 and D-3, for birds and mammals, respectively SSRBC: Site-specific risk-based concentration



## UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4 ATLANTA FEDERAL CENTER 61 FORSYTH STREET ATLANTA, GEORGIA 30303-8960

July 17, 2014

4SD-SRB

Ms. E. Gayle Macolly Manager, Remedial Projects Solutia, Inc. 702 Clydesdale Avenue Anniston, Alabama 36201-5328

RE:

Streamlined Ecological Risk Assessment for Operable Unit (OU)-1/OU-2

Anniston PCB Site, Anniston, Alabama

EPA CERCLA ID # ALD000400123 EPA RCRA ID # ALD004019048

Dear Ms. Macolly:

The United Stated Environmental Protection Agency has reviewed the revised Streamlined Ecological Risk Assessment (SERA) dated December 2013, for Operable Unit (OU)-1/OU-2 at the Anniston PCB Site in Anniston, Alabama. Most of the EPA's technical comments were addressed by the revision. However, the inclusion of risk management language within this document is inappropriate because the SERA should present only the risk characterization results from the risk assessment process. Furthermore, it is the EPA's responsibility to make risk management decisions. It must be understood that decisional language in the SERA does not represent the Agency's decision making.

Instead of revising the document again, please include this comment letter with the December 2013 SERA in Appendix E of the Remedial Investigation Report. The summary of the SERA included in the RI must be revised to reflect these comments (i.e., risk management decision language should be removed). Approval of the SERA will be provided when the RI for OU-1/OU-2 is approved.

#### **GENERAL COMMENTS:**

1. The SERA was revised to enhance the description of the urbanized terrestrial habitat in OU-1/OU-2. Text on Page 1-2 indicated that the exposure to terrestrial receptors was expected to be within acceptable limits. Since no ecological risk assessment was performed for the terrestrial portion of OU-1/OU-2, the text should clarify that statements regarding the acceptability of risks to terrestrial wildlife are based on professional judgment. While habitat is generally limited in OU-1/OU-2, the operable unit contains riparian habitat. The EPA's decision to limit the evaluation of the

- terrestrial risk assessment at the Screening Level Ecological Risk Assessment in OU-1/OU-2 is due to the disturbed nature of the area due to development and higher levels of human activity. A more complete ecological risk assessment is being performed in OU-4 where the terrestrial habitat is of higher quality.
- 2. Habitat to aquatic or riparian wildlife is limited in OU-1/OU-2. Wide-ranging wildlife, however, utilize the habitat of OU-4 as well as OU-1/OU-2. The conclusion in Sections 2.3 and 6.4.4 that wildlife populations cannot be exposed due to the limited habitat provided is too narrowly focused on Snow Creek, when wildlife do not recognize the operational boundaries established for risk management purposes. The risk conclusions should not assume wide-ranging wildlife are exposed only in Snow Creek. The risks to wide-ranging wildlife should be described holistically over the entire extent of contamination. If OU-1/OU-2 is too small to support populations of wildlife receptors, conclusions regarding effects to populations should be deferred to the OU-4 BERA, at which time the description of the spatial extent of risk should assume wildlife are exposed to the combined area of OU-1, OU-2, and OU-4. This comparison is not intended to be in terms of tables or calculations, but in terms of the description of the spatial extent of the risk in the overall risk conclusions. Risk conclusions made in the SERA should be limited to the assessment endpoints and risk questions.

## SPECIFIC COMMENTS:

- 1. Appendix A, Section 2.2.2, Emergent Insects, and Section 6.3.2, Pages 6-13 & 6-14. Text on Page 6-14 adds several paragraphs of information about crane flies. The text explains that terrestrial forms of crane flies might have been collected. The comparison to the PCB concentration in nearby soils (instead of using the nearby sediments for comparison) partially explained the higher bioaccumulation factors observed in the emergent insect samples that were composed primarily of crane flies. Text suggests that crane fly samples might not be representative of aquatic emergent insects based on comparisons with emergent insect data from other sites. The suggestion is that the crane flies collected were terrestrial. The text is implying uncertainty in the crane fly data. Text should be clarified to explain that uncertainty was only surrounding the lack of knowledge of whether the crane flies were aquatic or terrestrial but not uncertainty in the analytical data.
- 2. Appendix A, Section 2.2.2, Emergent Insects, and Section 6.3.2, Page 6-14. Text on Page 6-14 further explains that Housatonic River and Kalamazoo River sites developed their bioaccumulation factors by taking the higher of the median or the geometric mean of the bioaccumulation factors for individual data pairs. Since for the BAFs for the tissues (other than the crane flies) used the median BAF, please comment on whether use of the median BAF versus the higher of the median BAF or the geometric mean BAF makes a difference.
- 3. Figures 3-1 and 3-2. The figures from the RI that add the concentrations of dioxin TEQs should be part of the SERA.

- 4. Section 6.3.3.2, TECs and PECs. Page 6-19. The end of the section indicated that the MacDonald et al. 2000 screening values will likely overestimate toxicity due to unaddressed co-contaminants in chemical mixtures and un-addressed site-specific factors that may influence bioavailability. These issues can confound both the MacDonald et al. 2000 screening values and the toxicity evaluation at this site, which uses dose-response curves, but still largely ignores co-contaminants and site-specific factors affecting bioavailability. Rather than simply concluding that the TECs and PECs are overly conservative, additional discussion should be included about the co-contaminant and confounding factors issues relative to the site-specific toxicity data. In addition to enhancing the discussion of confounding factors to the toxicity tests in the uncertainty section, the text on Page 6-19 should be modified to state that the MacDonald et al. 2000 screening values can overestimate toxicity instead of are likely to overestimate toxicity.
- 5. Section 6.4, Risk Findings, and 6.4.4, Summary, Pages 6-21 through 6-24. The summary should add a paragraph referring back to the assessment endpoints and risk questions. The conclusions should be worded relative to the risk questions, which speak of survival, growth and reproduction versus stating conclusions in terms of effects on individual animals or local populations near the site. Risks to local populations that are exposed to the site should not be discounted due to the small size of OU-1/OU-2, given that the size of the site is the extent of contamination not the size of any given operable unit.
- 6. Appendix B, Section 3, Results and Discussion, Pages 5-6. Appendix B on the interpretation of sediment toxicity testing added the EC0, EC10, EC20, etc. range of total PCB Aroclor concentrations associated with toxic effects on the benthic community assessment endpoint. The values the EPA requested were included. The text, however, stated that the regression-predicted PCB concentration at the bottom of the reference envelope (EC0) should not be used as a threshold for remediation decisions. The text indicated that the EC20 value should be used for remedial decisions. It is premature to recommend a remedial decision in the SERA. The EC0 is intended for use as a sensitive toxicity threshold. The reason given in the SERA not to use the EC0 as a cleanup decision was the large variability in control responses in the tests.

Variability in the control responses was accounted for in the development of the ECO. The control treatments were included in the study design to evaluate test acceptability. In addition, the control results provided a way of normalizing the results obtained for samples that were tested in two or more batches. Such normalization of the results accounts for any non-treatment related factors (e.g., differences in starting size of test organisms, etc.) that could influence the results of the toxicity test. Such normalization makes the data generated in multiple batches comparable and, hence, amenable to aggregation during data analyses.

Comparison of toxicity test results obtained for sediment samples from the exposure area to the negative control results is not relevant for several reasons. First, an

approach to data analysis that treated negative controls as something other than a control was not described in the study plan. Second, there are many uncertainties associated with designating toxicity based on comparisons to the negative controls. The control samples were not reference sediments. They were tests run on laboratory sediment of a different makeup from those collected for the study. The controls do not represent site-specific conditions.

In addition to normalizing by the control response, the selection of the reference envelope for interpreting the sediment toxicity data accounted for the variability in the toxicity test responses. A response lower than the average response observed at a reference station is used when a study has one or two reference samples, but taking the average response and adjusting it 20 percent lower is not necessary when a study has five reference samples. With five reference samples, the lowest response among the reference samples is a good predictor of the lowest possible response within the reference population. There is no need to take the lowest response within the reference population and adjust it even lower as was done for the EC20.

Sediment samples were collected from the reference area and from various exposure areas for use in toxicity testing. The results of such toxicity testing facilitated determination of the reference envelope for each species tested and endpoint measured. Reference envelopes developed in this way provide a robust basis for evaluating the toxicity of sediment samples at the site; because they explicitly account for the site-specific factors that can influence organism response, with the exception of exposure to COPCs. Hence, response outside the range of the reference envelope can be attributed to COPC exposure. This is a very powerful approach for that reason.

- 7. Appendix B, Section 3, Results and Discussion, Pages 5-6. The terminology EC0, EC20, etc. is misleading because it implies that these quantities were estimated by a statistical fit to a dose response curve, when the EC0 was actually the bottom of the reference envelope and the EC20 was 20 percent lower than the bottom of the reference envelope. The true EC0 is the mean of the reference envelope and the true EC20 is 20 percent lower than the mean of the reference envelope. The EC0 as used in Appendix B is more like an apparent effects threshold, because all responses above the EC0 are toxic relative to the reference envelope. The EC20 as used in Appendix B is a value 20 percent higher than the apparent effects threshold, which means that concentrations above the EC20 are 20 percent more toxic than the most impaired reference sediment. Toxicity at a site 20 percent higher than the highest adverse response observed at a reference station means that the EC20 value is less than conservative.
- 8. Appendix B, Section 3, Results and Discussion, Pages 5-6. Using the bottom of the reference envelope accounts for variability in the test endpoints by factoring in the observed variability within the reference envelope. The approach assumes that the variability within the reference envelope is similar to the variability in the test response at a given exposure. Figures B-2 and B-3 show that the variability in the test

responses does not appear to increase with increasing exposure concentration. The figures illustrate how the bottom of the reference envelope is effective in accounting for variability. There is no reason to recommend the EC20 value on account of variability in test conditions affecting the EC0. The EC0 has already factored in all the variability described in Appendix B.

If you should have any questions please feel free to contact me at (404)562-8935.

Sincerely,

Pamela J. Langston Scully, P.E.

Remedial Project Manager Superfund Remedial Branch

cc;

Mr. Julie Peshkin, Monsanto

Mr. G. Douglas Jones, Esq.

Mr. Thomas Dahl

Mr. Bertrand Thomas, TA

Mr. David Baker, CAG



Pharmacia LLC and Solutia Inc.

Remedial Investigation Report for Operable Unit 1/Operable Unit 2 of the Anniston PCB Site

**Appendix F - Nonresidential Floodplain Soil EPC Calculations** 

September 2014

## **Table of Contents**



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## **Tables**

Table 1 - OU-1/OU-2 Floodplain Soil Non-Residential EPC Comparison Summary

## **Attachments**

Attachment 1 - Total PCBs Data Summary



#### 1. Introduction

This appendix to the *Remedial Investigation Report for Operable Unit 1/Operable Unit 2 of the Anniston PCB Site* describes the data and procedures used to calculate the non-residential floodplain soil exposure point concentrations (EPCs) used for exposure units (EUs) for Operable Units 1 and 2 (OU-1/OU-2) of the Anniston PCB Site. Additionally, this appendix presents a comparison of the original set of EPCs calculated by Camp, Dresser, and McKee (CDM) on behalf of the United States Environmental Protection Agency (USEPA) as part of the February 2010 OU-1/OU-2 Human Health Risk Assessment (HHRA) (CDM 2010) and the most recent EPCs calculated by ARCADIS with an updated dataset.

The floodplain soil data for the OU-1/OU-2 HHRA were provided to USEPA on July 23, 2008 as part of a data deliverable and were subsequently utilized to generate surface soil (i.e., upper 1 foot) EPCs for the OU-1/OU-2 EUs in the HHRA (values from the HHRA are provided in Table 1). Since that time, data have been added to and deleted from the OU-1/OU-2 dataset related to land-use classification, interim measures (IMs), and the inclusion and/or collection of additional data within OU-1/OU-2. The updated floodplain soil dataset for OU-1/OU-2 results in a more representative EPC moving forward into the Feasibility Study (FS) stage of the project. Attachment 1 presents a sample-by-sample summary for each EU that highlights the data that were removed from and added to the dataset since the 2008 data submission along with a brief note explaining why any data were removed from the dataset since 2008.

This appendix presents a comparison of EPCs using the updated dataset following the procedure used in the OU-1/OU-2 HHRA. Analyses were also performed to evaluate using a different treatment of Special Use related data. EPCs were calculated following both procedures using ProUCL Version 4.1 (USEPA 2013) and represent the Recommended 95% Upper Confidence Limit (UCL) for each EU. It should be noted that ProUCL Version 5.0 (USEPA 2014) was released in the fall of 2013, but it is still undergoing internal testing and we are not recommending its adoption for use at this time. Using ProUCL Version 4.1 also provides a consistent platform to evaluate changes in data handling procedure and reduces the potential introduction of additional variability in EPC calculations brought on by changes in the software.

#### 2. Dataset Summary

Since the data submittal to USEPA in 2008, additional/new data have been incorporated into the assessment of the non-residential areas of OU-1/OU-2 and some



data previously included have been excluded based on changes in land use classification, IMs, or other data-related decisions. The updated floodplain soil dataset reflects the most current and comprehensive collection of data for the non-residential Areas of OU-1/OU-2 and allows for the calculation of an EPC that is more reflective of the current site conditions.

Based on the extensive review of investigation programs conducted in OU-1/OU-2, floodplain soil data from the following programs were added to the OU-1/OU-2 nonresidential dataset:

- Special Use Sampling (2007 2014)
- Miscellaneous Administrative Order on Consent Data (various programs 2000 – 2005)
- Residential Sampling (various programs 2000 2003; inclusions due to change in parcel use from residential to nonresidential)
- 2000 USEPA Non-residential Grab Samples (2000)
- 9<sup>th</sup> Street Ditch (2002)
- Central Staging and Soil Management Area (CSSMA) (1995 1996)
- OU-2 Non-residential Sampling (various programs 2008 2012)
- First Missionary Baptist Church (1998 2000)
- Historical Soil Data (various programs 1995 1999)
- Miller Property (2002)
- West 10<sup>th</sup> Street Ditch Soil Sampling (1998)
- Lucky 7 Lounge Sampling (2002)
- Auto Beauty Shop (2001)
- Clevenger Property (2002)
- Cabometer (2002)

Based on the same review, data were removed from the 2008 dataset in accordance with the following:

- Data from the Special Use program identified as High-Activity Areas were
  considered to be part of the residential program and, as such, removed from
  the nonresidential dataset. This review was facilitated by the delineation of
  high activity and low activity sampling areas in the project geographic
  information system and tying those areas to specific composite samples.
- Grab data collected as part of other programs that fell within the geographic boundary of a high activity area were removed from the nonresidential dataset.



- Reclassification of a select area from nonresidential to residential based on changes in land-use since 2008 resulted in the removal of some data from the dataset.
- Select locations that had been previously sampled, but since have undergone remedial work (i.e., soil removed) as part of an IM were considered no longer representative and were removed from the dataset.

As indicated above, a sample-specific list of data added or removed can be found in Attachment 1.

## 3. HHRA Calculation Method Summary

Based on a review of the data provided to USEPA in 2008 and the 2010 OU-1/OU-2 HHRA (CDM 2010) including appendices, ARCADIS has concluded that the following procedures were used for the EPC calculations in the HHRA by CDM:

- The maximum value between a parent sample/field duplicate pair was used to represent the pair.
- Locations with samples collected from multiple depth intervals were represented by an arithmetic mean of the concentrations.
- Sample locations from Special Use areas that were collected specifically
  under the Special Use program (i.e., those samples with an HA or LA
  designation in the sample name) were represented by taking a singular
  average of all locations from a given parcel. (It should be noted that these
  samples were collected from distinct geographies within the parcel and
  averaging them is inconsistent with the way the other data were handled
  within each EU).
- Nondetected concentrations were represented by the reporting limit in both methods and the ProUCL software calculated UCLs using the "with NDs" function to generate results to account for nondetects, as determined by the software's assessment of data distribution. ProUCL provides a recommended UCL for use, which is used for this exercise as the EPC.

Using the updated nonresidential OU-1/OU-2 dataset, EPCs were re-calculated using this method and are presented in Table 1.



#### 4. Hybrid HHRA Calculation Method Summary

The hybrid HHRA method used the methodology outlined above with the exception that that Special Use sampling locations were retained as a discrete samples and not averaged. These results are also presented in Table 1.

#### 5. Comparison of EPCs and Discussion

Table 1 presents the HHRA results from the original 2008 dataset as well as the results for the alternative method described above (i.e., HHRA Method, and Hybrid HHRA Method) using the updated dataset. As shown in Table 1, there are some differences between EPC results based on the database updates and alternate calculation methodologies. In general, it appears that the changes to the dataset resulted in greater changes to the EPCs than the alternate calculation methodology.

Comparison between the HHRA Method and the hybrid HHRA Method described above, which differed only in how the Special Use area sampling locations were represented, resulted in generally comparable results. The greatest difference in EPCs between these methods was in EU 6 and EU 13. In EU 6, the EPC decreased from 14 milligrams per kilogram (mg/kg) to 6.5 mg/kg as much of the special use low activity data were less than 1 mg/kg. In EU 13, the EPC actually increased which is likely due to the impacts of higher values not being averaged out as well as higher variability in the dataset.

Comparison of the EPCs calculated using the updated dataset and HHRA method of calculation to the original HHRA EPCs shows slight differences (less than 25%) in 17 of the 30 EUs. The greatest differences were observed for EUs 2, 3, 5, 6, 10, 11, 14S 25, and 26. These differences are attributed to the inclusion of additional sampling data or the removal of data associated with the IMs. A description of data changes for each of these EUs is presented below:

• EU 2: The largest change to the EU 2 dataset impacting the estimated EPC was the removal of two samples (240 mg/kg and 80 mg/kg) from location CA-02-1468-02 on a parcel that is now considered part of the residential program and was remediated as such. Additionally, four other samples were removed from the dataset because they fall in a Special Use area classified as high activity and two other samples fell into areas now classified as residential. In addition to the removal of data, 42 samples from various



- programs were added to the dataset. The EPC decreased from 54 mg/kg in the HHRA to 2.2 mg/kg using the revised dataset.
- EU 3: The largest change to the EU 3 dataset impacting the estimated EPC was the addition of 17 samples from collection programs in 1996 that were added to the dataset. The calculated EPC increased from 11 mg/kg in the HHRA to 18 mg/kg using the revised dataset.
- EU 5: In EU 5, the dataset was expanded with the addition of 80 samples
  collected as part of the first Missionary Baptist Church evaluation and other
  programs associated with the miller property and CSSMA. The EPC in EU 5
  increased from 232 mg/kg in the HHRA to 350 mg/kg using the revised
  dataset.
- EU 6: The largest change to the EU 6 dataset impacting the estimated EPC was the removal of 14 samples reclassified as high-activity Special Use and the removal of two samples due to remedial actions. Nine more samples were also added to the dataset. The EPC increased from 7.5 mg/kg in the HHRA to 14 mg/kg using the revised dataset.
- EU 10: The EU 10 dataset was modified by the inclusion of data collected from the Auto Beauty property (37 samples), Clevenger Appliance property (65 samples), and Cabometer property (7 samples). The EPC in EU 10 decreased from 43 mg/kg in the HHRA to 19 mg/kg using the revised dataset
- EU 11: The EU 11 dataset was augmented by the inclusion of 11 samples from five locations collected as part of the Cabometer evaluation. The EPC increased form 1.8 mg/kg in the HHRA to 2.8 mg/kg using the revised dataset.
- EU 14 South: The largest change to the EU 14 South dataset impacting the
  estimated EPC was the reclassification of seven samples to the high-activity
  Special Use category and the removal of two points (one for reclassification
  to residential and the other impacted by a removal action). Two samples
  collected as part of the Special Use program were added to the dataset. The
  EPC in EU 14 South decreased from 1.8 mg/kg in the HHRA to 0.56 mg/kg
  using the revised dataset.
- EU 25: The EU 25 dataset was altered by the change of matrix classification from soil to sediment in four samples. These four sediment samples were determined to be within Snow Creek and not representative of soil conditions. The EPC in EU 25 decreased from 3.1 mg/kg in the HHRA to 0.56 mg/kg using the revised dataset.
- EU 26: The EU 26 dataset was affected by the removal of three samples determined to be within the extent of the isolation cover placed on the Hall



Street property and the addition of data (five samples) from previous sampling programs now incorporated into the dataset. The EPC in EU 26 decreased from 103 mg/kg in the HHRA to 34 mg/kg using the revised dataset.

#### 6. References

CDM. 2010. Anniston PCB Site Operable Units 1 and 2 Baseline Risk Assessment, Anniston, Alabama, Final Human Health Baseline Risk Assessment Report.

USEPA. 2013. ProUCL Version 4.1 User Guide (Draft): Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Prepared by Lockheed Martin Environmental Services. EPA/600/R-07/041. Available online at: http://www.epa.gov/osp/hstl/tsc/ProUCL\_v4.1\_user.pdf.

USEPA. 2014. ProUCL Software. Website. http://www.epa.gov/osp/hstl/tsc/software.htm.



**Tables** 

Table 1
OU-1/OU-2 Floodplain Soil Non-Residential EPC Comparison Summary
Anniston PCB Site, Anniston, Alabama

OU-1/OU-2 EU	HHRA Locations (n)	HHRA Table b- 3.1A UCL Value (mg/kg)	HHRA UCL Backup Value (mg/kg)	Number of Samples Added <sup>1</sup>	Number of Samples Removed <sup>1</sup>	Locations for Analyses using Updated Database (n) <sup>2</sup>	HHRA Method - Updated Dataset UCL Value (mg/kg)	HHRA Hybrid Method UCL Value (mg/kg)
1	14	7.8	7.8	9	3	21 [16]	8.4	11
2	22	54	54	42	8	55 [54]	2.2	2.4
3	20	11	11	17	0	37 [36]	18	18
4	22	0.74	0.74	36	8	53	0.78	0.77
5	21	232	232	80	1	92	350	350
6	22	7.4	7.4	9	16	40 [23]	14	6.5
7	21	164	164	8	6	22	160	160
8	11	1.2	1.2	14	2	25 [24]	0.66	0.63
9	19	0.95	0.93	0	0	28 [20]	0.90	0.61
10	20	43	43	109	0	92 [90]	19	18
11	20	1.8	1.8	11	0	25	2.8	2.8
12	10	10	9.6	0	0	10	9.6	9.6
13	11	11	10	1	1	13 [12]	9.5	17
14 north	10	24	24	5	0	14	21	21
14 south	11	1.82	1.82	2	9	11 [8]	0.56	1.4
15/16	41	1.5	1.5	5	6	44 [40]	1.9	1.4
17	25	4.7	4.7	0	0	25	4.7	4.7
18	20	0.34	0.34	3	0	23 [21]	0.33	0.31
19 north	16	540	540	0	0	13	660	660
19 south	12	73	73	1	0	13	68	68
20	14	2.7	2.7	0	7	7	4.0	4.0
21	20	0.5	0.6	0	0	20	0.51	0.51
22	24	7.6	7.6	1	0	25	7.3	7.3
23	20	0.41	0.38	0	0	20	0.41	0.40
24	37	12	12	0	0	36	12	12
25	21	3.1	3.1	0	4	17	0.56	0.56
26	24	103	99	5	3	23	34	34
27	20	0.46	0.48	0	0	20	0.45	0.46
29	21	0.19	0.19	0	0	21	0.19	0.20
30	27	0.12	0.12	0	17	10	SS	SS

#### Table 1

#### OU-1/OU-2 Floodplain Soil Non-Residential EPC Comparison Summary Anniston PCB Site, Anniston, Alabama

#### Notes:

- 1. Number of samples (n) added and removed represent individual sample count changes and cannot be directly compared with the numbers of locations.
- 2. Number of unique locations in the updated dataset. Bracketed values indicate number of locations after taking an average of special use locations for HHRA Method.
- 3. Blue highlighted columns represent EPCs calculated and reported previously by HHRA method (CDM 2008).

HHRA Method = maximum value for field duplicates/parent samples. Locations with multiple intervals within 1-foot were represented by arithmetic average. Also, special use locations represented by an arithmetic average.

HHRA Method: maximum value for field duplicates/parent samples. Locations with multiple intervals within 1-foot were represented by arithmetic average. Special use locations retained as discrete samples.

EPCs: exposure point concentrations

EU: exposure unit

HHRA: human health risk assessment

mg/kg: miligrams per kilogram

SS: not evaluated because sample size insuficient for ProUCL

UCL: upper confidence limit; calculated by ProUCL Version 4.1 (USEPA 2013).



## Attachment 1

Total PCBs Data Summary

#### Attachment 1 Total PCBs Data Summary - CA1 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
1	CA-01-3928-01	CA-01-3928-01	1144527.0	648541.9	S70396	Original	0	0.5	0.421		Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-3928-02	CA-01-3928-02	1144968.1	648554.7	S70397	Original	0	0.5	0.55		Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-3928-02	CA-01-3928-02	1144968.1	648554.7	S70398	Field Duplicate	0	0.5	0.611		Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-3928-03	CA-01-3928-03	1144476.9	648599.0	S70399	Original	0	0.5	0.365		Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-3928-04	CA-01-3928-04	1144763.2	648608.2	S70400	Original	0	0.5	0.229		Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-4760-05	CA-01-4760-05	1143422.0	648555.3	S70401	Original	0	0.5	1.24		Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-9999-06	CA-01-9999-06	1146305.7	647500.6	S70402	Original	0	0.5	1.31		Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-9999-07	CA-01-9999-07	1146192.9	647532.9	S70403	Original	0	0.5	3.65	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-9999-08	CA-01-9999-08	1146411.7	647551.6	S70404	Original	0	0.5	5.8		Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-01-9999-08	CA-01-9999-08	1146411.7	647551.6	S70501	Original	0.5	1	24.2	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
1	CA-1-3503-LA-A		1145381.7	648017.6	3503-LA-3A	Original	0	0.25	0.32		Updated Only		Special Use Sampling
1	CA-1-3503-LA-A		1145381.7	648017.6	3503-LA-3A-X	Field Duplicate	0	0.25	0.43	J	Updated Only		Special Use Sampling
1	CA-1-3503-LA-B		1145381.7	648017.6	3503-LA-3B	Original	0	0.25	0.3		Updated Only		Special Use Sampling
1	CA-1-3503-LA-C		1145381.7	648017.6	3503-LA-3C	Original	0	0.25	0.5		Updated Only		Special Use Sampling
1	CA-1-3503-LA-D		1145381.7	648017.6	3503-LA-3D	Original	0	0.25	1.59		Updated Only		Special Use Sampling
1	CA-1-3503-LA-F		1145381.7	648017.6	3503-LA-3F	Original	0	0.25	0.211		Updated Only		Special Use Sampling
1	CA-1-EPA-43140-100	CA-1-EPA-43140-100	1145468.9	648087.8	PA-053-B	Original	0	0.25	1.1		Original Dataset	Reclassified High Activity Area	2000 USEPA Nonresidential Grab Samples
1	CA-1-EPA-43140-101	CA-1-EPA-43140-101	1145571.9	648204.5	PA-053-A	Original	0	0.25	0.012		Original Dataset	Reclassified High Activity Area	2000 USEPA Nonresidential Grab Samples
1	CA-1-RES-3950-A	CA-1-RES-3950-A	1144862.6	648444.5	2202OBH-3A	Original	0	0.25	7.37	J	Both Datasets		Residential Sampling
1	CA-1-RES-3950-B	CA-1-RES-3950-B	1144862.6	648444.5	2202OBH-3B	Original	0	0.25	8	J	Both Datasets		Residential Sampling
1	CA-1-SU-3341-A	CA-1-SU-3341-A	1145842.6	647430.8	3341-HA-3A	Original	0	0.25	0.46		Original Dataset	Reclassified High Activity Area	Special Use Sampling
1	CA-1-SU-3341-B	CA-1-SU-3341-B	1145842.6	647430.8	3341-LA-3B	Original	0	0.25	1.6	U	Both Datasets	Was provided to USEPA, but non-detect values were excluded	Special Use Sampling
1	CA-1-SU-3402-A	CA-1-SU-3402-A	1145681.6	647455.9	3402-LA-3A	Original	0	0.25	0.65	J	Both Datasets		Special Use Sampling
1	CA-1-SU-3402-B	CA-1-SU-3402-B	1145681.6	647455.9	3402-LA-3B	Original	0	0.25	20.2		Both Datasets		Special Use Sampling
1	FC1-0026-A		1144821.2	648220.3	FC1-0026-A	Original	0	0.25	0.05	U	Updated Only		USEPA Programs
1	FC1-0026-B		1144793.4	648129.0	FC1-0026-B	Original	0	0.25	5.3		Updated Only		USEPA Programs
1	PC-036-A		1144921.2	648338.4	PC-036-A	Original	0	0.25	0.6		Updated Only		USEPA Programs

Data were new additions to dataset.
Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet
All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value
U: indicates value is below laboratory detection limits

EU: exposure unit FSP: field sampling plan

OU: operable unit

QC: quality control

USEPA: United States Environmental Protection Agency

### Attachment 1 Total PCBs Data Summary - CA2 Anniston PCB Site, Anniston, Alabama

							Depth	Depth	Result		Dataset		
EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Top	Bottom	Value	Qualifier	Comparison	Notes	Program
2	1006CA-A		1148905.8	650337.0	1006CA-3A	Original	0	0.25	0.97		Updated Dataset		Miscellaneous Programs
2	1006CA-A		1148905.8	650337.0	1006CA-6A	Original	0.25	0.5	0.45		Updated Dataset		Miscellaneous Programs
2	1006CA-B		1148892.3	650148.5	1006CA-3B	Original	0	0.25	2.1		Updated Dataset		Miscellaneous Programs
2	1006CA-B		1148892.3	650148.5	1006CA-6B	Original	0.25	0.5	1.25		Updated Dataset		Miscellaneous Programs
2	1006CA-C		1148708.4	650276.6	1006CA-3C	Original	0	0.25	1.35		Updated Dataset		Miscellaneous Programs
2	1006CA-C		1148708.4	650276.6	1006CA-6C	Original	0.25	0.5	2.5		Updated Dataset		Miscellaneous Programs
2	1006CA-D		1148646.4	650297.4	1006CA-3D	Original	0	0.25	4.42	J	Updated Dataset		Miscellaneous Programs
2	1006CA-D		1148646.4	650297.4	1006CA-6D	Original	0.25	0.5	2.97		Updated Dataset		Miscellaneous Programs
2	CA-02-1467-01	CA-02-1467-01	1149379.0	650162.9	S70001	Original	0	0.5	0.29		Original Dataset	Reclassified High Activity Area	OU-1/OU-2 Nonresidential FSP
2	CA-02-1467-01	CA-02-1467-01	1149379.0	650162.9	S70002	Field Duplicate	0	0.5	0.3		Original Dataset	Reclassified High Activity Area	OU-1/OU-2 Nonresidential FSP
2	CA-02-1468-02	CA-02-1468-02	1149404.6	649960.9	S70003	Original	0	0.5	80		Original Dataset	Residential location/sample	OU-1/OU-2 Nonresidential FSP
2	CA-02-1468-02	CA-02-1468-02	1149404.6	649960.9	S70506	Original	0.5	1	240		Original Dataset	Residential location/sample	OU-1/OU-2 Nonresidential FSP
2	CA-02-1471-03	CA-02-1471-03	1149259.5	649331.8	S70004	Original	0	0.5	0.711		Both Datasets		Nonresidential OU-1/OU-2 FSP
2	CA-02-1471-04	CA-02-1471-04	1149097.1	649397.0	S70005	Original	0	0.5	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
2	CA-02-1471-05	CA-02-1471-05	1149086.1	649558.0	S70006	Original	0	0.5	1.31		Both Datasets		Nonresidential OU-1/OU-2 FSP
2	CA-02-1471-06	CA-02-1471-06	1149272.9	649580.9	S70007	Original	0	0.5	1.57		Both Datasets		Nonresidential OU-1/OU-2 FSP
2	CA-02-1741-07	CA-02-1741-07	1148952.8	650301.4	S70008	Original	0	0.5	2.54		Both Datasets		Nonresidential OU-1/OU-2 FSP
2	CA-02-1871-08	CA-02-1871-08	1148755.6	650168.3	S70009	Original	0	0.5	0.71		Both Datasets		Nonresidential OU-1/OU-2 FSP
2	CA-02-1872-09	CA-02-1872-09	1148743.4	649862.2	S70010	Original	0	0.5	1.57		Original Dataset	Residential location/sample	OU-1/OU-2 Nonresidential FSP
2	CA-02-1907-10	CA-02-1907-10	1148565.2	649915.7	S70011	Original	0	0.5	0.428		Original Dataset	Residential location/sample	OU-1/OU-2 Nonresidential FSP
2	CA-02-1909-90	CA-2-EPA-1909-201	1148653.7	650281.8	FC2-0010-B	Original	0	0.25	12.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
2	CA-02-1909-90	CA-02-1909-90	1148653.7	650281.8	S70511	Original	0.5	1	1.54	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
2	CA-02-1966-11	CA-02-1966-11	1148628.1	650254.8	S70012	Original	0	0.5	4.87		Both Datasets		Nonresidential OU-1/OU-2 FSP
2		CA-02-SU-1467-HA-A	1149393.9	650099.7	1467-HA-3A	Original	0	0.25	3.05		Original Dataset	Reclassified High Activity Area	Special Use Sampling
2		CA-02-SU-1467-LA-B	1149393.9	650099.7	1467-LA-3B	Original	0	0.25	0.61		Both Datasets		Special Use Sampling
2	CA-02-SU-1467-LA-C	CA-02-SU-1467-LA-C	1149393.9	650099.7	1467-LA-3C	Original	0	0.25	0.66		Both Datasets		Special Use Sampling
2	CA-2-EPA-1589-207	CA-2-EPA-1589-207	1149120.1	649876.6	PC-061-A	Original	0	0.25	0.45		Original Dataset	Reclassified High Activity  Area	2000 EPA Nonresidential Grab Samples
2	CA-2-SU-1589-LA-A		1149082.1	649894.6	1589-LA-3A	Original	0	0.25	0.22		Updated Dataset		Special Use Sampling
2	FC1-0018-A		1148340.3	648463.4	FC1-0018-A	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
2	FC1-0018-B		1148295.6	648341.5	FC1-0018-B	Original	0	0.25	2.7		Updated Dataset		USEPA Programs
2	FC1-0018-C		1148289.2	648322.8	FC1-0018-C	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
2	FC1-0018-D		1148217.0	648037.4	FC1-0018-D	Original	0	0.25	0.19	U	Updated Dataset		USEPA Programs
2	FC2-0009-A		1148740.5	650337.4	FC2-0009-A	Original	0	0.25	2.19		Updated Dataset		USEPA Programs
2	FC2-0009-B	CA-2-EPA-1870-202	1148718.0	650247.6	FC2-0009-B	Original	0	0.25	2.1		Both Datasets		USEPA Programs
2	FC2-0010-A		1148660.7	650327.7	FC2-0010-A	Original	0	0.25	12		Updated Dataset		USEPA Programs

### Attachment 1 Total PCBs Data Summary - CA2 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
2	FC3-0048-A		1148387.2	649286.5	FC3-0048-A	Original	0	0.25	0.3		Updated Dataset		Residential Sampling
2	FC3-0048-C		1148394.9	649317.6	FC3-0048-C	Original	0	0.25	1.62		Updated Dataset		Residential Sampling
2	FC3-0048-D		1148419.3	649319.5	FC3-0048-D	Original	0	0.25	0.05	U	Updated Dataset		Residential Sampling
2	FC4-0017-A		1148420.4	649517.0	FC4-0017-A	Original	0	0.25	1.31		Updated Dataset		USEPA Programs
2	FC4-0017-B		1148357.1	649484.8	FC4-0017-B	Original	0	0.25	2		Updated Dataset		USEPA Programs
2	FC4-0017-C		1148329.4	649603.5	FC4-0017-C	Original	0	0.25	0.39		Updated Dataset		USEPA Programs
2	FC4-0017-D		1148463.8	649596.3	FC4-0017-D	Original	0	0.25	0.36		Updated Dataset		USEPA Programs
2	FC4-0018-A		1148397.7	649089.8	FC4-0018-A	Original	0	0.25	0.72		Updated Dataset		USEPA Programs
2	FC4-0018-D		1148350.9	648979.9	FC4-0018-D	Original	0	0.25	0.34		Updated Dataset		USEPA Programs
2	FC4-0019-A		1148375.1	649105.3	FC4-0019-A	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
2	FC4-0019-A2		1148415.9	649171.4	FC4-0019-A2	Original	0	0.25	25	U	Updated Dataset		USEPA Programs
2	FC4-0022-B	CA-2-EPA-1741-203	1148793.2	650216.8	FC4-0022-B	Original	0	0.25	0.93		Both Datasets		USEPA Programs
2	FC4-0023-A	CA-2-EPA-1744-206	1148937.8	650223.2	FC4-0023-A	Original	0	0.25	0.05	U	Both Datasets		USEPA Programs
2	FC4-0023-B	CA-2-EPA-1744-205	1148928.4	650196.7	FC4-0023-B	Original	0	0.25	0.05	U	Both Datasets		USEPA Programs
2	FC4-0023-C		1148943.0	650179.4	FC4-0023-C	Original	0	0.25	0.96		Updated Dataset		USEPA Programs
2	FC4-0023-D	CA-2-EPA-1744-204	1148924.9	650142.4	FC4-0023-D	Original	0	0.25	0.65		Both Datasets		USEPA Programs
2	FC4-0029-D		1149412.0	650055.0	FC4-0029-D	Original	0	0.25	0.39		Updated Dataset		USEPA Programs
2	FC4-0029-E		1149395.0	650010.0	FC4-0029-E	Original	0	0.25	1.51		Updated Dataset		USEPA Programs
2	FC4-0029-F		1149436.0	650032.8	FC4-0029-F	Original	0	0.25	0.75		Updated Dataset		USEPA Programs
2	FC4-0033-B	CA-2-EPA-1194-209	1149287.9	649553.5	FC4-0033-B	Original	0	0.25	0.35		Both Datasets		USEPA Programs
2	FC4-0033-C	CA-2-EPA-1194-208	1149254.9	649487.6	FC4-0033-C	Original	0	0.25	1.04		Both Datasets		USEPA Programs
2	PC-041-B		1148280.3	648496.0	PC-041-B	Original	0	0.25	1.13		Updated Dataset		Residential Sampling
2	PC-082-A		1148422.6	649089.2	PC-082-A	Original	0	0.25	0.11		Updated Dataset		USEPA Programs
2	PD1-022-A		1148427.2	649001.2	PD1-022-A	Original	0	0.25	0.73		Updated Dataset		USEPA Programs
2	PD1-022-B		1148408.8	649088.7	PD1-022-B	Original	0	0.25	0.86		Updated Dataset		USEPA Programs
2	PD1-028-B		1148600.7	650302.6	PD1-028-B	Original	0	0.25	5		Updated Dataset		USEPA Programs
2	PD1-029-A		1148621.1	650164.9	PD1-029-A	Original	0	0.25	8.3		Updated Dataset		USEPA Programs
2	PE-060-A		1148364.0	648533.9	PE-060-A	Original	0	0.25	0.308		Updated Dataset		USEPA Programs
2	PE-060-B		1148272.2	648189.4	PE-060-B	Original	0	0.25	2.1		Updated Dataset		USEPA Programs
2	PE-063-A		1148436.0	649097.7	PE-063-A	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
2	PE-063-B		1148452.2	649230.8	PE-063-B	Original	0	0.25	0.75		Updated Dataset		USEPA Programs
2	W9_2156_LBSTA1		1148274.7	648331.5	W9SC2156LBST A1COMP	Original	0	0.5	1.75		Updated Dataset		9th Street Ditch
2	W9_2156_RBSTA1		1148274.7	648331.5	W9SC2156RBST A1COMP	Original	0	0.5	0.98		Updated Dataset		9th Street Ditch

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA3 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth	Depth	Result	Qualifier	Dataset	Notes	Program
-	OA 0 OH 4700 LA D	- <b>3</b>	4440050.0	050450.0	4700 LA 0D	Orderinal	Тор	Bottom	Value		Comparison		ű
3	CA-3-SU-1700-LA-B CA-3-SU-1700-LA-C		1148956.9 1148956.9	650453.2 650453.2	1700-LA-3B 1700-LA-3C	Original Original	0	0.25	1.12 0.775		Updated Dataset Updated Dataset		Special Use Sampling Special Use Sampling
3	CA-3-SU-1803-LA-C		1148814.8	650449.3	1803-LA-3C	Original	0	0.25	0.775		Updated Dataset		Special Use Sampling
3	CA-03-1449-01	CA-03-1449-01	1149469.0	650428.0	S70013	Original	0	0.25	0.71		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1449-01 CA-03-1449-02	CA-03-1449-01 CA-03-1449-02	1149469.0	650499.9	S70013	Original	0	0.5	0.234	1	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1449-02 CA-03-1450-03	CA-03-1449-02 CA-03-1450-03	1149440.1	650560.9	S70014 S70015	Original	0	0.5	0.303	-	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1430-03 CA-03-1529-04	CA-03-1430-03 CA-03-1529-04	1149230.1	650402.0	S70015	Original	0	0.5	0.358		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1329-04 CA-03-1805-05	CA-03-1329-04 CA-03-1805-05	1148839.1	650808.0	S70010	Original	0	0.5	0.362		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1805-05	CA-03-1805-06	1148825.9	650967.0	S70017	Original	0	0.5	0.502	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-07	CA-03-1806-07	1148715.0	650757.9	S70018	Original	0	0.5	0.045	,	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-08	CA-03-1806-08	1148595.0	650790.0	S70013	Original	0	0.5	0.048		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-09	CA-03-1806-09	1148536.0	650794.0	S70020	Original	0	0.5	0.476		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-10	CA-03-1806-10	1148602.0	650842.9	S70021	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-11	CA-03-1806-11	1148775.0	650861.0	S70022	Original	0	0.5	0.050	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-12	CA-03-1806-12	1148722.1	650888.0	S70024	Original	0	0.5	0.284	.i	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-13	CA-03-1806-13	1148655.1	650900.0	S70025	Original	0	0.5	0.315	.j	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-14	CA-03-1806-14	1148759.9	650970.0	S70026	Original	0	0.5	0.644	Ť	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-15	CA-03-1806-15	1148639.9	651002.0	S70027	Original	0	0.5	0.319		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-15	CA-03-1806-15	1148639.9	651002.0	S70028	Field Duplicate	0	0.5	0.343		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-16	CA-03-1806-16	1148706.9	651019.9	S70029	Original	0	0.5	0.28	J.	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-17	CA-03-1806-17	1148820.0	651179.1	S70030	Original	0	0.5	0.224	Ĵ	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-18	CA-03-1806-18	1148796.0	651417.9	S70031	Original	0	0.5	14.5		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-2018-19	CA-03-2018-19	1148506.0	650578.0	S70032	Original	0	0.5	0.89		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-2018-20	CA-03-2018-20	1148422.9	650684.0	S70033	Original	0	0.5	1.9		Both Datasets		Nonresidential OU-1/OU-2 FSP
3	CA-03-1806-18	CA-03-1806-18	1148796.0	651417.9	S70516	Original	0.5	1	44.5	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
3	ESL097		1148340.5	650481.6	ESL97	Original	0	0.25	7.1		Updated Dataset		Miscellaneous Programs
3	ESL098		1148370.9	650520.7	ESL98	Original	0	0.25	4.3		Updated Dataset		Miscellaneous Programs
3	ESL099		1148411.7	650556.3	ESL99	Original	0	0.25	1.2	U	Updated Dataset		Miscellaneous Programs
3	ESL100		1148375.2	650576.3	ESL100	Original	0	0.25	3.9		Updated Dataset		Miscellaneous Programs
3	ESL101		1148298.7	650559.8	ESL101	Original	0	0.25	5.5		Updated Dataset		Miscellaneous Programs
3	ESL102		1148388.2	650691.0	ESL102	Original	0	0.25	4.3		Updated Dataset		Miscellaneous Programs
3	ESL103		1148384.3	650704.4	ESL103	Original	0	0.25	3.8		Updated Dataset		Miscellaneous Programs
3	ESL105		1148491.6	650712.5	ESL105	Original	0	0.25	1.2	U	Updated Dataset		Miscellaneous Programs
3	LINEASL01D		1148541.9	650996.1	LINEASL01D	Original	0	0.25	26.5		Updated Dataset		Miscellaneous Programs
3	LINEASL01E		1148556.1	650990.7	LINEASL01E	Original	0	0.25	11.3		Updated Dataset		Miscellaneous Programs
3	LINEASL01F		1148565.5	650987.1	LINEASL01F	Original	0	0.25	1.1	U	Updated Dataset		Miscellaneous Programs
3	LINEASL02D		1148720.9	651314.0	LINEASL02D	Original	0	0.25	19.7		Updated Dataset		Miscellaneous Programs
3	LINEASL02E		1148735.1	651308.5	LINEASL02E	Original	0	0.25	28.7		Updated Dataset		Miscellaneous Programs
3	LINEASL02F		1148744.4	651305.0	LINEASL02F	Original	0	0.25	6.8		Updated Dataset		Miscellaneous Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA4 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
4	CA-04-0900-01	CA-04-0900-01	1150359.1	651589.9	S70044	Original	0	0.5	0.225		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-0900-01	CA-04-0900-01	1150359.1	651589.9	S70045	Field Duplicate	0	0.5	0.258		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-0901-02	CA-04-0901-02	1150268.1	651632.0	S70046	Original	0	0.5	0.255		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-0904-03	CA-04-0904-03	1150107.0	651296.1	S70047	Original	0	0.5	0.571		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-0904-04	CA-04-0904-04	1150029.3	651336.2	S70048	Original	0	0.5	0.91		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-0904-05	CA-04-0904-05	1150386.0	651374.1	S70049	Original	0	0.5	0.801	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-0904-06	CA-04-0904-06	1150200.3	651381.6	S70050	Original	0	0.5	0.037	U	Original Dataset	Reclassified High Activity  Area	OU-1/OU-2 Nonresidential FSP
4	CA-04-1015-07	CA-04-1015-07	1150038.0	651688.1	S70034	Original	0	0.5	0.389		Both Datasets	AlGa	Nonresidential OU-1/OU-2 FSP
4	CA-04-1015-08	CA-04-1015-08	1150130.1	651715.9	S70035	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-1080-09	CA-04-1080-09	1149980.0	651786.1	S70036	Original	0	0.5	0.687		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-1080-10	CA-04-1080-10	1150099.1	651841.0	S70037	Original	0	0.5	0.355		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-1183-11	CA-04-1183-11	1149809.0	651646.0	S70038	Original	0	0.5	0.318		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-1213-12	CA-04-1213-12	1149843.0	650639.0	S70039	Original	0	0.5	0.403	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-1295-13	CA-04-1295-13	1149723.2	650234.5	S70040	Original	0	0.5	0.837		Both Datasets		Nonresidential OU-1/OU-2 FSP
4	CA-04-1298-14 CA-04-1353-15	CA-04-1298-14 CA-04-1353-15	1149685.3 1149636.9	650484.2 650190.9	\$70041 \$70042	Original Original	0	0.5 0.5	0.76 0.084	J	Both Datasets Both Datasets		Nonresidential OU-1/OU-2 FSP Nonresidential OU-1/OU-2 FSP
4	CA-04-1353-15 CA-04-1365-16	CA-04-1353-15 CA-04-1365-16	1149530.9	650401.0	S70042 S70043	Original	0	0.5	1.21		Both Datasets		Nonresidential OU-1/OU-2 FSP
4												Reclassified High Activity	
4	CA-04-SU-1349-LA-D	CA-04-SU-1349-LA-D	1149604.2	651374.3	1349-LA-3D	Original	0	0.25	0.318		Original Dataset	Area	Special Use Sampling
4	CA-04-SU-1349-LA-E	CA-04-SU-1349-LA-E	1149604.2	651374.3	1349-LA-3E	Original	0	0.25	0.8	J	Both Datasets		Special Use Sampling
4	CA-04-SU-1350-HA-A	CA-04-SU-1350-HA-A	1149604.2	651374.3	1350-HA-3A	Original	0	0.25	4.8		Original Dataset	Reclassified High Activity Area	Special Use Sampling
4	CA-04-SU-1350-LA-B	CA-04-SU-1350-LA-B	1149604.2	651374.3	1350-HA-3B	Original	0	0.25	1.8		Original Dataset	Reclassified High Activity Area	Special Use Sampling
4	CA-04-SU-1350-LA-C	CA-04-SU-1350-LA-C	1149604.2	651374.3	1350-HA-3C	Original	0	0.25	2.27		Original Dataset	Reclassified High Activity Area	Special Use Sampling
4	CA-4-EPA-1186-400	CA-4-EPA-1186-400	1149870.6	650700.0	FC2-0076-C	Original	0	0.25	1.89		Original Dataset	Residential location/sample	2000 EPA Nonresidential Grab Samples
4	CA-4-EPA-904-401	CA-4-EPA-904-401	1150190.9	651314.6	PA-051-A	Original	0	0.25	0.48		Original Dataset	Reclassified High Activity Area	2000 EPA Nonresidential Grab Samples
4	CA-4-EPA-904-402	CA-4-EPA-904-402	1150198.3	651397.0	PA-051-B	Original	0	0.25	0.72		Original Dataset	Reclassified High Activity Area	2000 EPA Nonresidential Grab Samples
4	CA-4-SU-904-A	CA-4-SU-904-A	1150183.6	651329.7	904-LA-3A	Original	0	0.25	0.27		Both Datasets		Special Use Sampling
4	FC2-0076-E		1149864.6	650556.6	FC2-0076-E	Original	0	0.25	0.9		Updated Dataset		USEPA Programs
4	FC3-0003-A		1149997.3	651401.2	FC3-0003-A	Original	0	0.25	1.77		Updated Dataset		Residential Sampling
4	FC3-0003-B FC3-0003-C		1150005.5 1150016.1	651365.2 651322.3	FC3-0003-B FC3-0003-C	Original Original	0	0.25 0.25	1.61 0.91		Updated Dataset Updated Dataset		Residential Sampling Residential Sampling
4	FC3-0003-C		1149987.3	651304.7	FC3-0003-C	Original	0	0.25	1.33	-	Updated Dataset		Residential Sampling Residential Sampling
4	FC4-0024-A		1149618.7	650172.2	FC4-0024-A	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
4	FC4-0024-B		1149600.1	650164.4	FC4-0024-B	Original	0	0.25	1.72		Updated Dataset		USEPA Programs
4	HA-049		1149554.1	650111.7	HA-49	Original	0	0.5	0.5	U	Updated Dataset		Miscellaneous Programs
4	HA-050		1149598.6	650112.0	HA-50	Original	0	0.5	0.5	U	Updated Dataset		Miscellaneous Programs
4	HA-051		1149599.0	650148.7	HA-51	Original	0	0.5	0.5	U	Updated Dataset		Miscellaneous Programs
4	HA-051		1149599.0	650148.7	HA-51-dup	Field Duplicate	0	0.5	0.5	U	Updated Dataset		Miscellaneous Programs
4	HA-052		1149643.5	650148.6	HA-52	Original	0	0.5	0.5	U	Updated Dataset		Miscellaneous Programs
4	HA-053		1149599.5	650186.6	HA-53	Original	0	0.5	0.5	U	Updated Dataset		Miscellaneous Programs
4	HA-054 PC-083-A		1149644.5 1150277.2	650185.1 651823.4	HA-54 PC-083-A	Original Original	0	0.5 0.25	0.5 0.111	U	Updated Dataset Updated Dataset		Miscellaneous Programs USEPA Programs
4	PC-083-A		1150277.2	651768.3	PC-083-A PC-083-B	Original	0	0.25	0.111	U	Updated Dataset		USEPA Programs
4	PC-084-A		1149910.7	651875.8	PC-083-B PC-084-A	Original	0	0.25	0.67		Updated Dataset		USEPA Programs
4	PC-084-B		1149900.3	651801.4	PC-084-B	Original	0	0.25	0.119		Updated Dataset		USEPA Programs
4	PE-001-B		1149650.7	651476.8	PE-001-B	Original	0	0.25	0.175		Updated Dataset		USEPA Programs
4	PE-002-A		1149763.5	651454.3	PE-002-A	Original	0	0.25	0.259		Updated Dataset		USEPA Programs
4	PE-002-B		1149754.6	651525.7	PE-002-B	Original	0	0.25	0.43		Updated Dataset		USEPA Programs
4	PE-003-A		1149769.4	651449.1	PE-003-A	Original	0	0.25	0.64		Updated Dataset		USEPA Programs
4	PE-003-B		1149764.9	651595.0	PE-003-B	Original	0	0.25	0.222		Updated Dataset		USEPA Programs
4	PE-012-A		1150369.6	651616.9	PE-012-A	Original	0	0.25 0.25	0.361 0.28		Updated Dataset		USEPA Programs
4	PE-012-B PE-014-A		1150329.5	651590.4	PE-012-B PE-014-A	Original Original	0	0.25	0.28 1.848		Updated Dataset		USEPA Programs USEPA Programs
4	PE-014-A PE-014-B		1149860.6 1149847.1	650700.3 650637.2	PE-014-A PE-014-B	Original Original	0	0.25	1.848 0.81		Updated Dataset Updated Dataset		USEPA Programs USEPA Programs
	PF-023-A		1150118.0	651382.5	PF-023-A	Original	0	0.25	0.81		Updated Dataset		USEPA Programs
4						. Unullial	-	0.23	0.70		- Opudiou Dalasel		OOLI A i Togramo

### Attachment 1 Total PCBs Data Summary - CA4 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
4	PF-024-A		1150120.5	651299.0	PF-024-A	Original	0	0.25	0.77		Updated Dataset		USEPA Programs
4	PF-027-A		1150282.8	651283.7	PF-027-A	Original	0	0.25	0.97		Updated Dataset		USEPA Programs
4	PF-028-A		1150289.8	651358.4	PF-028-A	Original	0	0.25	0.74		Updated Dataset		USEPA Programs
4	PF-029-A		1150202.8	651482.4	PF-029-A	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
4	PF-030-A	CA-4-EPA-42997-403	1150370.1	651331.8	PF-030-A	Original	0	0.25	0.94		Both Datasets		USEPA Programs
4	W9_1191_LBSTA1		1149905.1	650463.4	W9SC1191LBST A1COMP	Original	0	0.5	0.82		Updated Dataset		9th Street Ditch
4	W9_1191_LBSTA2		1149859.5	650397.9	W9SC1191LBST A2COMP	Original	0	0.5	0.32		Updated Dataset		9th Street Ditch
4	W9_1191_RBSTA1		1149905.1	650463.4	W9SC1191RBST A1COMP	Original	0	0.5	2.56		Updated Dataset		9th Street Ditch
4	W9_1191_RBSTA2		1149859.5	650397.9	W9SC1191RBST A2COMP	Original	0	0.5	1.71		Updated Dataset		9th Street Ditch

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA5 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
5	10-DS-3		1148502.5	652505.4	10-DS-3	Original	0	0.5	0.082	U	Updated Dataset		Miscellaneous Programs
5	ASED300		1148680.6	651387.4	ASED300	Original	0	0.25	130		Updated Dataset		CSSMA
5	ASED350		1148704.5	651429.0	ASED350	Original	0	0.25	39.2		Updated Dataset		CSSMA
5	ASED400		1148732.5	651479.6	ASED400	Original	0	0.25	77		Updated Dataset		CSSMA
5	ASED450		1148751.7	651522.7	ASED450	Original	0	0.25	106		Updated Dataset		CSSMA
5	ASED500		1148777.3	651565.8	ASED500	Original	0	0.25	82		Updated Dataset		CSSMA
5	ASED550		1148800.9	651604.7	ASED550	Original	0	0.25	279		Updated Dataset		CSSMA
5	ASL040		1148516.6	652240.7	ASL40	Original	0	0.25	1.2	U	Updated Dataset		Miscellaneous Programs
5	ASL045		1148626.8	652081.9	ASL45	Original	0	0.25	1.4	U	Updated Dataset		Miscellaneous Programs
5	ASL056		1148496.4	651713.3	ASL56	Original	0	0.25	4.9		Updated Dataset		Miscellaneous Programs
5	ASL107		1148148.3	650713.1	ASL107	Original	0	0.25	2.88		Updated Dataset		Miscellaneous Programs
5	ASL107		1148148.3	650713.1	ASL107	Field Duplicate	0	0.25	2.88		Updated Dataset		Miscellaneous Programs
5	ASL-134		1148965.5	652735.4	ASL-134	Original	0	0.25	11.02		Updated Dataset		Miscellaneous Programs
5	ASL-135		1149017.5	652726.8	ASL-135	Original	0	0.25	2.9		Updated Dataset		Miscellaneous Programs
5	ASL-136		1148786.9	652838.6	ASL-136	Original	0	0.25	3.59		Updated Dataset		Miscellaneous Programs
5	ASL-136		1148786.9	652838.6	ASL-136 Dup	Field Duplicate	0	0.25	3.34		Updated Dataset		Miscellaneous Programs
5	ASL-137		1148790.2	652891.7	ASL-137	Original	_	0.25	6.12		Updated Dataset		Miscellaneous Programs
5	ASL-138		1148792.1	652946.9	ASL-138	Original	0	0.25	110 3		Updated Dataset Updated Dataset		Miscellaneous Programs
5	ASL-139 ASL-140		1148732.6 1148842.7	652841.2 652836.4	ASL-139 ASL-140	Original	0	0.25 0.25	11.46				Miscellaneous Programs
5	ASL-140 ASL157		1148842.7	652836.4	ASL-140 ASL157	Original Original	0	0.25	11.46		Updated Dataset Updated Dataset		Miscellaneous Programs Miscellaneous Programs
5	ASL157 ASL158		1148423.4	650968.5	ASL157 ASL158	Original	0	0.25	9.5		Updated Dataset		Miscellaneous Programs  Miscellaneous Programs
5	ASL-182		1148430.0	652920.5	ASL158 ASL-182(0-3)	Original	0	0.25	5.9		Updated Dataset		Miscellaneous Programs  Miscellaneous Programs
5	ASL-182 ASL-183		1148792.9	652953.1	ASL-182(0-3) ASL-183(0-3)	Original	0	0.25	41		Updated Dataset		Miscellaneous Programs  Miscellaneous Programs
5	ASL-184		1148795.3	652972.4	ASL-184(0-3)	Original	0	0.25	59		Updated Dataset		Miscellaneous Programs
5	ASL-185		1148811.0	652950.2	ASL-185(0-3)	Original	0	0.25	120		Updated Dataset		Miscellaneous Programs
5	ASL-189		1148872.7	652838.6	ASL-189	Original	0	0.25	89		Updated Dataset		Miscellaneous Programs
5	ASL-190		1148874.3	652809.5	ASL-190	Original	0	0.25	11		Updated Dataset		Miscellaneous Programs
5	ASL-195		1148955.7	652900.4	ASL-195(0-3)	Original	0	0.25	61		Updated Dataset		Miscellaneous Programs
5	ASL-196		1148924.5	652941.1	ASL-196(0-3)	Original	0	0.25	46		Updated Dataset		Miscellaneous Programs
5	ASL-197		1148894.2	652982.7	ASL-197(0-3)	Original	0	0.25	78		Updated Dataset		Miscellaneous Programs
5	ASL-199		1148839.2	653062.0	ASL-199(0-3)	Original	0	0.25	23.8		Updated Dataset		Miscellaneous Programs
5	ASL-200		1148854.6	653132.1	ASL-200(0-3)	Original	0	0.25	52		Updated Dataset		Miscellaneous Programs
5	ASL-202		1148907.6	653055.4	ASL-202(0-3)	Original	0	0.25	69.1		Updated Dataset		Miscellaneous Programs
5	ASL-202		1148907.6	653055.4	ASL-202-dup(0-3)	Field Duplicate	0	0.25	32.7		Updated Dataset		Miscellaneous Programs
5	ASL-206		1148982.8	653030.4	ASL-206(0-3)	Original	0	0.25	73		Updated Dataset		Miscellaneous Programs
5	ASL-207		1148945.7	653069.4	ASL-207(0-3)	Original	0	0.25	91		Updated Dataset		Miscellaneous Programs
5	ASL-209		1148898.6	653156.6	ASL-209(0-3)	Original	0	0.25	2.09		Updated Dataset		Miscellaneous Programs
5	ASL-211		1148891.9	653285.9	ASL-211(0-3)	Original	0	0.25	0.5		Updated Dataset		Miscellaneous Programs
5	ASL-215		1148924.1	653325.4	ASL-215A(0-3)	Original	0	0.25	0.099	U	Updated Dataset		Miscellaneous Programs
5	ASL-216		1148928.5	653381.3	ASL-216(0-3)	Original	0	0.25	2.85		Updated Dataset		Miscellaneous Programs
5	ASL-217		1148978.7	652698.2	ASL-217(0-3)	Original	0	0.25	0.42		Updated Dataset		Miscellaneous Programs
5	ASL-219		1148976.4	652595.7	ASL-219(0-3)	Original	0	0.25	0.132		Updated Dataset		Miscellaneous Programs
5	ASL-220		1148974.8	652549.5	ASL-220(0-3)	Original	0	0.25	0.047		Updated Dataset		Miscellaneous Programs
5	ASL-224	CA-05-ASL224	1148926.6	652699.5	ASL-224(0-3)	Original	0	0.25	0.26		Both Datasets		Miscellaneous Programs
5	ASL-226		1148832.2	652813.2	ASL-226(0-3)	Original	0	0.25	0.31		Updated Dataset		Miscellaneous Programs
5	ASL-229		1148678.9	652811.1	ASL-229(0-3)	Original	0	0.25	0.571		Updated Dataset		Miscellaneous Programs
5	ASL-230		1148681.8	652861.0	ASL-230(0-3)	Original	0	0.25	0.503		Updated Dataset		Miscellaneous Programs
5	ASL-232		1148909.5	652861.4	ASL-232(0-3)	Original	0	0.25	4.84		Updated Dataset		Miscellaneous Programs
5 5	ASL-233 ASL-233		1148870.1	652908.8	ASL-233(0-3)	Original	0	0.25 0.25	3.38 4.23		Updated Dataset		Miscellaneous Programs
	ASL-233 ASL-235		1148870.1 1148750.9	652908.8 652910.7	ASL-233-dup(0-3)	Field Duplicate	0	0.25	0.13		Updated Dataset		Miscellaneous Programs
5 5	ASL-235 ASL-237		1148750.9	653022.1	ASL-235(0-3) ASL-237(0-3)	Original Original	0	0.25	23.1		Updated Dataset Updated Dataset		Miscellaneous Programs
5	ASL-237 ASL-239		1148787.8	652658.6	ASL-237(0-3) ASL-239(0-3)	Original	0	0.25	0.87		Updated Dataset		Miscellaneous Programs Miscellaneous Programs
3	AGL-239		1140700.9	032030.0	A3L-239(0-3)	Original	0	0.23	0.67		Opualeu Dalasei	Result value adjusted to	IVIISCEIIANEOUS FIOGRAMS
5	ASL-242	CA-05-ASL242	1148813.8	652548.4	ASL-242(0-3)	Original	0	0.25	0.12	U	Both Datasets	reflect maximum reporting limit of individual Aroclors.	Miscellaneous Programs
5	ASL55		1148474.8	651604.4	ASL55	Original	0	0.25	9.8		Updated Dataset	a	CSSMA
5	CA-05-1782-01	CA-05-1782-01	1148191.0	650793.2	S70051	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-02	CA-05-1782-02	1148289.0	651213.1	S70052	Original	0	0.5	2.27		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-03	CA-05-1782-03	1148538.9	651412.0	S70053	Original	Ö	0.5	33.3	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-03	CA-05-1782-03	1148538.9	651412.0	S70521	Original	0.5	1	14.6		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-04	CA-05-1782-04	1148610.0	651447.0	S70054	Original	0	0.5	22.2	J	Both Datasets		Nonresidential OU-1/OU-2 FSP

### Attachment 1 Total PCBs Data Summary - CA5 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
5	CA-05-1782-04	CA-05-1782-04	1148610.0	651447.0	S70526	Original	0.5	1	45.9		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-05	CA-05-1782-05	1148554.9	651562.1	S70055	Original	0	0.5	171		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-05	CA-05-1782-05	1148554.9	651562.1	S70531	Original	0.5	1	610		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-06	CA-05-1782-06	1148699.1	651644.9	S70056	Original	0	0.5	13.7	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-06	CA-05-1782-06	1148699.1	651644.9	S70536	Original	0.5	1	28.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-06	CA-05-1782-06	1148699.1	651644.9	S70783	Field Duplicate	0.5	1	22.8		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1782-07	CA-05-1782-07	1148450.1	651727.0	S70057	Original	0	0.5	1.21		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1821-08	CA-05-1821-08	1148708.0	652061.4	S70058	Original	0	0.5	2.22		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1936-09	CA-05-1936-09	1148688.0	652533.8	S70059	Original	0	0.5	3.31		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1945-10	CA-05-1945-10	1148579.9	652117.4	S70060	Original	0	0.5	0.66	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-1996-11	CA-05-1996-11	1148569.8	652007.0	S70061	Original	0	0.5	0.182	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-2006-12	CA-05-2006-12	1148136.9	650478.1	S70062	Original	0	0.5	5.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-2006-12	CA-05-2006-12	1148136.9	650478.1	S70541	Original	0.5	1	4.07		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-8583-13	CA-05-8583-13	1149006.0	652761.8	S70063	Original	0	0.5	81.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-8583-13	CA-05-8583-13	1149006.0	652761.8	S70546	Original	0.5	1	9.65		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-8583-14	CA-05-8583-14	1148972.0	652940.1	S70064	Original	0	0.5	360		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-8583-14	CA-05-8583-14	1148972.0	652940.1	S70065	Field Duplicate	0	0.5	340		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-8583-14	CA-05-8583-14	1148972.0	652940.1	S70551	Original	0.5	1	4.8		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-05-8583-15	CA-05-8583-15	1148963.9	653187.3	S70066	Original	0	0.5	0.92		Both Datasets		Nonresidential OU-1/OU-2 FSP
5	CA-5-SU-1809-A	CA-5-SU-1809-A	1148758.1	652439.5	1809-HA-3A	Original	0	0.25	1.4		Original Dataset	Reclassified High Activity Area	Special Use Sampling
5	CA-5-SU-1809-B	CA-5-SU-1809-B	1148758.1	652439.5	1809-LA-3B	Original	0	0.25	0.177		Both Datasets		Special Use Sampling
5	MP-03		1148152.9	650715.0	MP-3 (0-3")	Original	0	0.25	0.74	J	Updated Dataset		Miller Property
5	MP-05		1148209.3	650747.6	MP-5 (0-3")	Original	0	0.25	3.73		Updated Dataset		Miller Property
5	MP-05		1148209.3	650747.6	MP-5 (6-12")	Original	0.5	1	0.58	J	Updated Dataset		Miller Property
5	MP-1		1148091.6	650495.7	MP-1 (0-3")	Original	0	0.25	2.9		Updated Dataset		Miller Property
5	MP-1		1148091.6	650495.7	MP-1 (6-12")	Original	0.5	1	2.4		Updated Dataset		Miller Property
5	MP-2		1148139.6	650576.8	MP-2 (0-3")	Original	0	0.25	0.88	J	Updated Dataset		Miller Property
5	MP-4		1148215.5	650640.6	MP-4 (0-3")	Original	0	0.25	2	J	Updated Dataset		Miller Property
5	MP-4		1148215.5	650640.6	MP-4 (6-12")	Original	0.5	1	0.406		Updated Dataset		Miller Property
5	MP-8		1148210.1	650927.0	MP-8 (0-3")	Original	0	0.25	2.4	J	Updated Dataset		Miller Property
5	MP-8		1148210.1	650927.0	MP-8 (6-12")	Original	0.5	1	0.34		Updated Dataset		Miller Property
5	PB-020-01	CA-5-EPA-1945-501	1148659.6	652153.3	PB-020-01	Original	0	0.25	0.74		Both Datasets		USEPA Programs
5	PB-020-02	CA-5-EPA-1945-500	1148534.7	652227.5	PB-020-02	Original	0	0.25	0.61		Both Datasets		USEPA Programs
5	PB-020-06	CA-5-EPA-1945-502	1148668.2	652242.6	PB-020-06	Original	0	0.25	2.9		Both Datasets		USEPA Programs
5	PB-020-07		1148668.2	652242.6	PB-020-07	Original	0	0.25	2.8	J	Updated Dataset		USEPA Programs
5	PB-RR-37		1148953.0	651994.7	PB-RR-37	Original	0	0.25	3650		Updated Dataset		USEPA Programs
5	PB-RR-40		1148953.0	651994.7	PB-RR-40	Original	0	0.25	2.3	J	Updated Dataset		USEPA Programs
5	PB-RR-42		1148803.2	651634.1	PB-RR-42	Original	0	0.25	0.21	U	Updated Dataset		USEPA Programs
5	RASL164		1148104.4	650509.0	RASL164	Original	0	0.25	0.077	U	Updated Dataset		Miscellaneous Programs
5	SED-A08		1148819.6	653031.4	SED-A8	Original	0	0.25	248		Updated Dataset		Miscellaneous Programs
5	SED-C1		1148684.1	651396.4	SED-C1	Original	0	0.25	41		Updated Dataset		CSSMA
5	T-11 E10		1148974.6	652946.9	T-11 E10 0-1'	Original	0	1	340	J	Updated Dataset		Nonresidential Other
5	T-11 N10		1148984.6	652936.9	T-11 N10 0-1'	Original	0	1	497		Updated Dataset		Nonresidential Other
5	T-11 S10		1148964.6	652936.9	T-11 S10 0-1'	Original	0	1	410	J	Updated Dataset		Nonresidential Other
5	T-11 S10		1148964.6	652936.9	T-11 S10 0-1'-X	Field Duplicate	0	1	430	J	Updated Dataset		Nonresidential Other
5	T-11 W10		1148974.6	652926.9	T-11 W10 0-1'	Original	0	1	350	J	Updated Dataset		Nonresidential Other
5	TH-2		1148794.8	652932.5	TH-2 (0.66)	Original	0.63	0.71	11		Updated Dataset		Miscellaneous Programs
5	TH-3		1148851.6	652866.4	TH-3 (0-0.5)	Original	0	0.5	250		Updated Dataset		Miscellaneous Programs
5	TH-4		1148920.5	652802.0	TH-4 (0-0.5)	Original	0	0.5	140		Updated Dataset		Miscellaneous Programs
5	TH-5		1148965.0	652749.9	TH-5 (0-0.5)	Original	0	0.5	10		Updated Dataset		Miscellaneous Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

CSSMA: central staging and soil management area

EU: exposure unit FSP: field sampling plan OU: operable unit

QC: quality control USEPA: United States Environmental Protection Agency

### Attachment 1 Total PCBs Data Summary - CA6 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Lagation	Manthina	Faating	Field Commis ID	00 Tumo	Depth	Depth	Result	Qualifier	Dataset	Notes	December
	•	Original Location	Northing	Easting	Field Sample ID	QC Type	Тор	Bottom	Value		Comparison	Notes	Program
6	10-DS-1		1148444.6	652497.6	10-DS-1	Original	0	0.5	0.082	U	Updated Dataset		Miscellaneous Programs
6	10-DS-2 1206WT-3A		1148444.5 1148294.0	652497.6 652065.0	10-DS-2 1206WT-3A	Original Original	0	0.5 0.25	0.96		Updated Dataset Updated Dataset		Miscellaneous Programs Miscellaneous Programs
6	1206WT-3A		1148294.0	651974.5	1206WT-3A 1206WT-3B	Original	0	0.25	0.081	U	Updated Dataset		Miscellaneous Programs
6	CA-06-2083-01	CA-06-2083-01	1148412.3	652427.5	S70067	Original	0	0.25	1.11	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
6	CA-06-2113-02	CA-06-2113-02	1148363.6	651772.9	S70068	Original	0	0.5	3.69		Both Datasets		Nonresidential OU-1/OU-2 FSP
6	CA-06-2136-03	CA-06-2136-03	1148271.0	651554.2	S70069	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
6	CA-06-2136-04	CA-06-2136-04	1148171.3	651618.6	S70070	Original	0	0.5	3.88	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-05	CA-06-2205-05	1147916.9	652047.6	S70071	Original	0	0.5	2.06		Original Dataset	Reclassified High Activity Area	Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-06	CA-06-2205-06	1147952.5	652070.6	S70072	Original	0	0.5	1.98		Original Dataset	Reclassified High Activity Area	Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-07	CA-06-2205-07	1148114.0	652121.0	S70073	Original	0	0.5	0.66	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-08	CA-06-2205-08	1147711.2	652124.9	S70074	Original	0	0.5	0.418		Original Dataset	Reclassified High Activity Area	Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-09	CA-06-2205-09	1148225.1	652217.0	S70075	Original	0	0.5	0.655		Original Dataset	Reclassified High Activity Area	Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-10	CA-06-2205-10	1147983.0	652235.0	S70076	Original	0	0.5	0.3		Original Dataset	Reclassified High Activity Area	Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-11	CA-06-2205-11	1147861.9	652290.9	S70077	Original	0	0.5	1.46		Both Datasets		Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-12	CA-06-2205-12	1147620.0	652321.9	S70078	Original	0	0.5	1.51		Both Datasets		Nonresidential OU-1/OU-2 FSP
6	CA-06-2205-13	CA-06-2205-13	1148164.9	652383.0	S70079	Original	0	0.5	0.388		Both Datasets		Nonresidential OU-1/OU-2 FSP
6	CA-06-2498-14	CA-06-2498-14	1147588.9	652126.0	S70080	Original	0	0.5	0.135		Both Datasets		Nonresidential OU-1/OU-2 FSP 2000 EPA Nonresidential Grab
6	CA-6-EPA-2189-601	CA-6-EPA-2189-601	1148147.3	651366.6	PA-126-B	Original	0	0.25	15.9		Original Dataset	IM Location/Sample	Samples 2000 EPA Nonresidential Grab
6	CA-6-EPA-2189-606	CA-6-EPA-2189-606	1148310.8	651533.2	PA-126-A	Original	0	0.25	11.2		Original Dataset	IM Location/Sample Reclassified High Activity	Samples 2000 EPA Nonresidential Grab
6	CA-6-EPA-2205-600 CA-6-SU-2113-LA-A	CA-6-EPA-2205-600	1147841.3 1148323.1	652207.1 651769.5	PA-047-B 2113-LA-3A	Original Original	0	0.25 0.25	2.01		Original Dataset Updated Dataset	Area	Samples Special Use Sampling
0						Original						Reclassified High Activity	
6	CA-6-SU-2205-A	CA-6-SU-2205-A	1147901.8	652255.3	2205-HA-3A	Original	0	0.25	0.315		Original Dataset	Area Reclassified High Activity	Special Use Sampling
6	CA-6-SU-2205-A	CA-6-SU-2205-A	1147901.8	652255.3	2205-HA-3A-X	Field Duplicate	0	0.25	0.217		Original Dataset	Area	Special Use Sampling
6	CA-6-SU-2205-B	CA-6-SU-2205-B	1147901.8	652255.3	2205-LA-3B	Original	0	0.25	0.51		Both Datasets	Reclassified High Activity	Special Use Sampling
6	CA-6-SU-2205-C	CA-6-SU-2205-C	1147901.8	652255.3	2205-HA-3C	Original	0	0.25	1.1		Original Dataset	Area	Special Use Sampling
6	CA-6-SU-2205-D	CA-6-SU-2205-D	1147901.8	652255.3	2205-LA-3D	Original	0	0.25	1.22		Both Datasets		Special Use Sampling
6	CA-6-SU-2205-E	CA-6-SU-2205-E	1147901.8	652255.3	2205-LA-3E	Original	0	0.25	0.52		Both Datasets		Special Use Sampling
6	CA-6-SU-2205-F	CA-6-SU-2205-F	1147901.8	652255.3	2205-HA-3F	Original	0	0.25	1.11		Original Dataset	Reclassified High Activity Area	Special Use Sampling
6	CA-6-SU-2205-G	CA-6-SU-2205-G	1147901.8	652255.3	2205-HA-3G	Original	0	0.25	0.52		Original Dataset	Reclassified High Activity Area	Special Use Sampling
6	CA-6-SU-2205-H	CA-6-SU-2205-H	1147901.8	652255.3	2205-HA-3H	Original	0	0.25	0.46		Original Dataset	Reclassified High Activity Area	Special Use Sampling
6	CA-6-SU-2205-I	CA-6-SU-2205-I	1147901.8	652255.3	2205-LA-3I	Original	0	0.25	0.39		Both Datasets		Special Use Sampling
6	CA-6-SU-2205-J	CA-6-SU-2205-J	1147901.8	652255.3	2205-HA-3J	Original	0	0.25	0.047		Original Dataset	Reclassified High Activity Area	Special Use Sampling
6	CA-6-SU-2205-K	CA-6-SU-2205-K	1147901.8	652255.3	2205-HA-3K	Original	0	0.25	0.65		Original Dataset	Reclassified High Activity Area	Special Use Sampling
6	CA-6-SU-2205-L	CA-6-SU-2205-L	1147901.8	652255.3	2205-LA-3L	Original	0	0.25	1.18	J	Both Datasets		Special Use Sampling
6	CA-6-SU-2205-M	CA-6-SU-2205-M	1147901.8	652255.3	2205-LA-3M	Original	0	0.25	0.79		Both Datasets		Special Use Sampling
6	CA-6-SU-2205-N	CA-6-SU-2205-N	1147901.8	652255.3	2205-LA-3N	Original	0	0.25	0.308		Both Datasets		Special Use Sampling
6	CA-6-SU-2205-O CA-6-SU-2205-P	CA-6-SU-2205-O CA-6-SU-2205-P	1147901.8 1147901.8	652255.3 652255.3	2205-LA-3O 2205-LA-3P	Original	0	0.25 0.25	0.46 0.61		Both Datasets Both Datasets		Special Use Sampling
6	CA-6-SU-2205-P CA-6-SU-2205-Q	CA-6-SU-2205-P	1147901.8	652255.3	2205-LA-3P 2205-LA-3Q	Original Original	0	0.25	0.61	J	Both Datasets  Both Datasets		Special Use Sampling Special Use Sampling
6	CA-6-SU-2205-R	CA-6-SU-2205-Q	1147901.8	652255.3	2205-LA-3Q 2205-LA-3R	Original	0	0.25	0.334	J	Both Datasets		Special Use Sampling
6	CA-6-SU-2205-S	CA-6-SU-2205-A	1147901.8	652255.3	2205-LA-3K	Original	0	0.25	0.388	J	Both Datasets		Special Use Sampling
6	CA-6-SU-2205-T	CA-6-SU-2205-T	1147901.8	652255.3	2205-LA-3T	Original	0	0.25	0.57	Ĭ	Both Datasets		Special Use Sampling
6	CA-6-SU-2205-U	CA-6-SU-2205-U	1147901.8	652255.3	2205-LA-3U	Original	0	0.25	0.19		Both Datasets		Special Use Sampling
6	CA-6-SU-2498-A	CA-6-SU-2498-A	1147620.4	652088.2	2498-LA-3A	Original	0	0.25	0.79		Both Datasets		Special Use Sampling
6	CA-6-SU-2498-B	CA-6-SU-2498-B	1147620.4	652088.2	2498-LA-3B	Original	0	0.25	0.531	J	Both Datasets		Special Use Sampling
6	CA-6-SU-2498-C	CA-6-SU-2498-C	1147620.4	652088.2	2498-LA-3C	Original	0	0.25	0.39	J	Both Datasets		Special Use Sampling
6	CA-6-SU-2498-D	CA-6-SU-2498-D	1147620.4	652088.2	2498-LA-3D	Original	0	0.25	0.778	J	Both Datasets		Special Use Sampling

### Attachment 1 Total PCBs Data Summary - CA6 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
6	CA-6-SU-2498-E	CA-6-SU-2498-E	1147620.4	652088.2	2498-LA-3E	Original	0	0.25	1.209	J	Both Datasets		Special Use Sampling
6	FC2-0044-B		1146700.2	652098.4	FC2-0044-B	Original	0	0.25	43		Updated Dataset		Residential Sampling
6	FC3-0029-A	CA-6-EPA-2096-605	1148297.4	652097.5	FC3-0029-A	Original	0	0.25	0.48		Both Datasets		USEPA Programs
6	FC3-0029-B		1148276.1	652080.4	FC3-0029-B	Original	0	0.25	0.57		Updated Dataset		USEPA Programs
6	FC3-0030-A	CA-6-EPA-2091-608	1148373.5	651978.5	FC3-0030-A	Original	0	0.25	0.05	U	Both Datasets		USEPA Programs
6	FC3-0030-B	CA-6-EPA-2091-607	1148334.6	651976.3	FC3-0030-B	Original	0	0.25	0.05	U	Both Datasets		USEPA Programs
6	FC3-0030-C		1148277.2	651998.8	FC3-0030-C	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
6	FC3-0030-D		1148269.9	652052.7	FC3-0030-D	Original	0	0.25	0.05	Ū	Updated Dataset		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

IM: interim measure

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA7 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth	Depth	Result Value	Qualifier	Dataset	Notes	Program
7	CA-07-1435-01	CA-07-1435-01	1149372.1	652618.1	S70081	Original	Top ∩	Bottom 0.5	0.82		Comparison Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1435-01	CA-07-1435-01 CA-07-1435-02	1149290.0	652783.0	S70081 S70082	Original	0	0.5	0.207	1	Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1435-02	CA-07-1435-02	1149174.0	652812.9	S70082 S70083	Original	0	0.5	0.65		Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1435-03	CA-07-1435-03	1149471.0	652864.6	S70083	Original	0	0.5	0.039	U	Both Datasets	<del> </del>	Nonresidential OU-1/OU-2 FSP
7	CA-07-1435-05	CA-07-1435-05	1149392.9	652879.9	S70085	Original	0	0.5	0.033		Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1435-05	CA-07-1435-06	1149493.0	653115.3	S70085	Original	0	0.5	0.127	1	Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1435-07	CA-07-1435-07	1149187.0	653276.0	S70087	Original	0	0.5	0.130		Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1433-07 CA-07-1520-08	CA-07-1433-07 CA-07-1520-08	1149169.9	652536.0	S70087	Original	0	0.5	7.88	1	Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1520-08	CA-07-1520-08	1149169.9	652536.0	S70556	Original	0.5	1	15.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1520-00	CA-07-1520-09	1149208.0	652552.0	S70089	Original	0.5	0.5	4.6		Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-07-1520-09	CA-07-1520-09	1149208.0	652552.0	S70090	Field Duplicate	0	0.5	4.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
7	CA-7-EPA-1435-703	CA-7-EPA-1435-703	1149269.0	653134.4	FC1-0044-D	Original	0	0.25	0.05	U	Original Dataset	Reclassified High Activity Area	2000 EPA Nonresidential Grab Samples
7	CA-7-EPA-1435-704	CA-7-EPA-1435-704	1149269.1	653070.1	FC1-0044-C	Original	0	0.25	0.05	U	Original Dataset	Reclassified High Activity Area	2000 EPA Nonresidential Grab Samples
7	CA-7-EPA-1435-704	CA-7-EPA-1435-704	1149269.1	653070.1	FC1-0044-C	Original	0	0.25	0.05	U	Original Dataset	Reclassified High Activity Area	2000 EPA Nonresidential Grab Samples
7	CA-7-EPA-1435-704	CA-7-EPA-1435-704	1149269.1	653070.1	FC1-0044-C	Original	0	0.25	0.05	U	Original Dataset	Reclassified High Activity Area	2000 EPA Nonresidential Grab Samples
7	CA-7-EPA-1435-704	CA-7-EPA-1435-704	1149269.1	653070.1	FC1-0044-C	Original	0	0.25	0.05	U	Original Dataset	Reclassified High Activity Area	2000 EPA Nonresidential Grab Samples
7	CA-7-EPA-1435-705	CA-7-EPA-1435-705	1149274.6	653132.1	PA-065-B	Original	0	0.25	0.15		Original Dataset	Reclassified High Activity Area	2000 EPA Nonresidential Grab Samples
7	CA-7-RES-1577-A	CA-7-RES-1577-A	1149158.6	652292.1	1577-3A	Original	0	0.25	310		Both Datasets		Residential Sampling
7	FC1-0044-A	CA-7-EPA-1435-709	1149443.2	653036.8	FC1-0044-A	Original	0	0.25	0.05	U	Both Datasets		USEPA Programs
7	FC1-0044-B	CA-7-EPA-1435-708	1149408.2	653190.6	FC1-0044-B	Original	0	0.25	0.05	U	Both Datasets		USEPA Programs
7	LINEASL03D		1148987.0	651888.2	LINEASL03D	Original	0	0.25	3.8		Updated Dataset		Miscellaneous Programs
7	LINEASL04E		1149089.0	652246.0	LINEASL04E	Original	0	0.25	17.3		Updated Dataset		Miscellaneous Programs
7	PA-100-A		1149431.6	652484.2	PA-100-A	Original	0	0.25	0.047		Updated Dataset		USEPA Programs
7	PA-100-B	CA-7-EPA-1435-706	1149287.4	652617.5	PA-100-B	Original	0	0.25	8.0		Both Datasets		USEPA Programs
7	PA-118-A	CA-7-EPA-1435-710	1149448.3	652591.2	PA-118-A	Original	0	0.25	1.9		Both Datasets		USEPA Programs
7	PA-118-B	CA-7-EPA-1435-707	1149380.8	652713.2	PA-118-B	Original	0	0.25	0.084		Both Datasets		USEPA Programs
7	PD2-012		1149220.5	652761.1	PD2-012	Original	0	0.25		R	Updated Dataset		USEPA Programs
7	PD2-014		1149241.0	652831.5	PD2-014	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
7	PD2-016		1149451.5	652829.1	PD2-016	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
7	PD2-019		1149399.7	653002.9	PD2-019	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
7	PECON-019		1149140.6	652230.1	PECON-019	Original	0	0.25	49.8	UJ	Updated Dataset		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

R: indicates result was rejected

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA8 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth	Depth	Result	Qualifier	Dataset	Notes	Program
	•	ŭ	ŭ	·	-		Тор	Bottom	Value	-,	Comparison		
8	CA-08-1004-01	CA-08-1004-01	1150149.1	652523.9	S70091	Original	0	0.5	1.11		Both Datasets		Nonresidential OU-1/OU-2 FSP
8	CA-08-1168-02	CA-08-1168-02	1149921.5	652161.1	S70092	Original	0	0.5	0.456		Both Datasets		Nonresidential OU-1/OU-2 FSP
8	CA-08-1168-03	CA-08-1168-03	1149723.9	652184.9	S70093	Original	0	0.5	0.435	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
8	CA-08-1209-04	CA-08-1209-04	1149839.0	651946.0	S70094	Original	0	0.5	0.71	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
8	CA-08-1209-05	CA-08-1209-05	1149757.0	652001.1	S70095	Original	0	0.5	0.195		Both Datasets		Nonresidential OU-1/OU-2 FSP
8	CA-08-1299-06	CA-08-1299-06	1149646.1	652106.0	S70096	Original	0	0.5	0.117		Both Datasets		Nonresidential OU-1/OU-2 FSP
8	CA-08-1317-07	CA-08-1317-07	1149632.0	652264.0	S70097	Original	0	0.5	0.873	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
8	CA-08-1374-08	CA-08-1374-08	1149548.9	652226.9	S70098	Original	0	0.5	0.982	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
8	CA-8-SU-890-A	CA-8-SU-890-A	1150340.2	652550.4	890-HA-3A	Original	0	0.25	0.081	C	Original Dataset	Reclassified High Activity Area	Special Use Sampling
8	CA-8-SU-890-B	CA-8-SU-890-B	1150340.2	652550.4	890-LA-3B	Original	0	0.25	0.091	U	Both Datasets	Was provided to USEPA, but non-detect values were excluded	Special Use Sampling
8	CA-8-SU-890-C	CA-8-SU-890-C	1150340.2	652550.4	890-HA-3C	Original	0	0.25	0.083	U	Original Dataset	Reclassified High Activity Area	Special Use Sampling
8	CA-8-SU-890-D	CA-8-SU-890-D	1150340.2	652550.4	890-LA-3D	Original	0	0.25	0.16		Both Datasets		Special Use Sampling
8	FC2-0028-D		1149672.1	652237.0	FC2-0028-D	Original	0	0.25	0.48		Updated Dataset		Residential Sampling
8	FC2-0029-A		1149689.3	652501.8	FC2-0029-A	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
8	FC2-0029-B		1149724.8	652500.2	FC2-0029-B	Original	0	0.25	0.34		Updated Dataset		USEPA Programs
8	FC2-0029-C		1149735.0	652455.4	FC2-0029-C	Original	0	0.25	0.49		Updated Dataset		USEPA Programs
8	FE3-002-A		1149671.6	651932.8	FE3-002-A	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
8	FE3-003-A		1149718.1	651936.6	FE3-003-A	Original	0	0.25	0.62		Updated Dataset		USEPA Programs
8	PA-092-A	CA-8-EPA-1317-800	1149568.7	652335.3	PA-092-A	Original	0	0.25	0.15		Both Datasets		USEPA Programs
8	PA-092-B	CA-8-EPA-1317-801	1149603.3	652314.4	PA-092-B	Original	0	0.25	2.5		Both Datasets		USEPA Programs
8	PC-087-A		1149680.2	652431.6	PC-087-A	Original	0	0.25	0.15		Updated Dataset		USEPA Programs
8	PE-071-A		1149594.9	651934.1	PE-071-A	Original	0	0.25	0.6		Updated Dataset		USEPA Programs
8	PE-071-B		1149602.2	652080.2	PE-071-B	Original	0	0.25	0.05		Updated Dataset		USEPA Programs
8	PF-006-A		1149573.6	651959.3	PF-006-A	Original	0	0.25	0.05	U	Updated Dataset		USEPA Programs
8	PF-006-B		1149573.1	652030.2	PF-006-B	Original	0	0.25	0.057		Updated Dataset		USEPA Programs
8	PF-007-A		1149635.7	651961.3	PF-007-A	Original	0	0.25	0.103		Updated Dataset		USEPA Programs
8	PF-007-B		1149638.8	652030.7	PF-007-B	Original	0	0.25	0.132		Updated Dataset		USEPA Programs
8	PF-007-B		1149638.8	652030.7	PF-007-BS	Original	0	0.25	0.202		Updated Dataset		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA9 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
9	CA-09-1504-01	CA-09-1504-01	1149100.7	653570.9	S70406	Original	0	0.5	0.051		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1504-02	CA-09-1504-02	1149176.1	653646.0	S70407	Original	0	0.5	0.043	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1504-03	CA-09-1504-03	1149295.9	653812.1	S70408	Original	0	0.5	0.043	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1504-04	CA-09-1504-04	1149056.9	653923.1	S70409	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1504-05	CA-09-1504-05	1149284.0	653964.4	S70410	Original	0	0.5	0.042	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1504-06	CA-09-1504-06	1149236.1	654145.0	S70411	Original	0	0.5	0.048	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1597-07	CA-09-1597-07	1149027.0	654920.0	S70412	Original	0	0.5	5.86		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1597-07	CA-09-1597-07	1149027.0	654920.0	S70561	Original	0.5	1	3.93		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1720-08	CA-09-1720-08	1148934.7	654658.3	S70413	Original	0	0.5	0.504	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1720-09	CA-09-1720-09	1148612.5	654698.5	S70414	Original	0	0.5	0.039		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1720-10	CA-09-1720-10	1148549.1	654864.8	S70415	Original	0	0.5	0.073		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1720-11	CA-09-1720-11	1148907.9	655087.1	S70416	Original	0	0.5	0.047	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1720-12	CA-09-1720-12	1148833.8	655280.6	S70417	Original	0	0.5	0.046		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1722-13	CA-09-1722-13	1148948.8	653687.1	S70418	Original	0	0.5	0.92		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1722-14	CA-09-1722-14	1148917.0	654005.8	S70419	Original	0	0.5	0.065		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1722-15	CA-09-1722-15	1148903.9	654262.7	S70420	Original	0	0.5	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1722-16	CA-09-1722-16	1148649.0	654448.9	S70421	Original	0	0.5	0.217		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1722-17	CA-09-1722-17	1148727.8	654533.0	S70422	Original	0	0.5	0.082		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-09-1722-17	CA-09-1722-17	1148727.8	654533.0	S70423	Field Duplicate	0	0.5	0.145		Both Datasets		Nonresidential OU-1/OU-2 FSP
9	CA-9-SU-1504-A	CA-9-SU-1504-A	1149177.7	653884.8	1504-LA-3A	Original	0	0.25	0.075	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	CA-9-SU-1504-B	CA-9-SU-1504-B	1149177.7	653884.8	1504-LA-3B	Original	0	0.25	0.081	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	CA-9-SU-1504-C	CA-9-SU-1504-C	1149177.7	653884.8	1504-LA-3C	Original	0	0.25	0.079	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	CA-9-SU-1504-D	CA-9-SU-1504-D	1149177.7	653884.8	1504-LA-3D	Original	0	0.25	0.073	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	CA-9-SU-1504-E	CA-9-SU-1504-E	1149177.7	653884.8	1504-LA-3E	Original	0	0.25	0.077	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	CA-9-SU-1504-F	CA-9-SU-1504-F	1149177.7	653884.8	1504-LA-3F	Original	0	0.25	0.078	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	CA-9-SU-1504-G	CA-9-SU-1504-G	1149177.7	653884.8	1504-LA-3G	Original	0	0.25	0.079	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	CA-9-SU-1504-H	CA-9-SU-1504-H	1149177.7	653884.8	1504-LA-3H	Original	0	0.25	0.076	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	CA-9-SU-1504-I	CA-9-SU-1504-I	1149177.7	653884.8	1504-LA-3I	Original	0	0.25	0.075	U	Both Datasets	Was provided to USEPA, but nondetect values were excluded	Special Use Sampling
9	PB-019-03	CA-9-EPA-1720-902	1148780.0	654081.6	PB-019-03	Original	0	0.25	0.57		Both Datasets		USEPA Programs
9	PB-019-08	CA-9-EPA-1720-900	1148540.3	655246.8	PB-019-08	Original	0	0.25	0.32		Both Datasets		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

## Attachment 1 Total PCBs Data Summary - CA10 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
10	ABS-1		1148535.6	653005.0	ABS-1 (0-0.5)	Original	0	0.5	0.073	U	Updated Dataset		Miscellaneous Programs
10	ABS-10		1148677.1	653115.1	ABS-10 (0-0.5)	Original	0	0.5	0.13	U	Updated Dataset		Miscellaneous Programs
10	ABS-11		1148654.8	653167.9	ABS-11 (0-0.5)	Original	0	0.5	0.46		Updated Dataset		Miscellaneous Programs
10	ABS-12		1148701.1	653181.3	ABS-12 (0-0.5)	Original	0	0.5	0.24		Updated Dataset		Miscellaneous Programs
10	ABS-13		1148720.5	653238.4	ABS-13 (0-0.5)	Original	0	0.5	31.5		Updated Dataset		Miscellaneous Programs
10	ABS-14		1148658.1	653247.6	ABS-14 (0-0.5)	Original	0	0.5	0.57		Updated Dataset		Miscellaneous Programs
10	ABS-15		1148721.8	653332.6	ABS-15 (0-0.5)	Original	0	0.5	130		Updated Dataset		Miscellaneous Programs
10 10	ABS-16 ABS-17		1148723.4 1148729.6	653370.0	ABS-16 (0-0.5)	Original	0	0.5 0.5	26.3		Updated Dataset		Miscellaneous Programs
10	ABS-17 ABS-18		1148729.6	653398.8 653408.6	ABS-17 (0-0.5) ABS-18 (0-0.5)	Original	0	0.5	14.7 31.9		Updated Dataset Updated Dataset		Miscellaneous Programs
10	ABS-18 ABS-19		1148672.8	653358.4	ABS-18 (0-0.5)	Original Original	0	0.5	15.8		Updated Dataset		Miscellaneous Programs Miscellaneous Programs
10	ABS-19 ABS-2		1148536.6	653051.4	ABS-19 (0-0.5)	Original	0	0.5	0.072	U	Updated Dataset		Miscellaneous Programs
10	ABS-20		1148663.4	653311.2	ABS-20 (0-0.5)	Original	0	0.5	19	0	Updated Dataset		Miscellaneous Programs
10	ABS-21		1148637.2	653294.1	ABS-21 (0-0.5)	Original	0	0.5	3.2		Updated Dataset		Miscellaneous Programs
10	ABS-22		1148606.2	653285.3	ABS-22 (0-0.5)	Original	0	0.5	1.5		Updated Dataset		Miscellaneous Programs
10	ABS-23		1148595.4	653333.5	ABS-23 (0-0.5)	Original	0	0.5	0.096		Updated Dataset		Miscellaneous Programs
10	ABS-24		1148626.8	653359.1	ABS-24 (0-0.5)	Original	0	0.5	5.8		Updated Dataset		Miscellaneous Programs
10	ABS-25		1148625.1	653400.5	ABS-25 (0-0.5)	Original	0	0.5	2.9		Updated Dataset		Miscellaneous Programs
10	ABS-26		1148539.4	653416.7	ABS-26 (0-0.5)	Original	0	0.5	0.93		Updated Dataset		Miscellaneous Programs
10	ABS-27		1148773.3	653410.0	ABS-27 (0-0.5)	Original	0	0.5	0.13		Updated Dataset		Miscellaneous Programs
10	ABS-28		1148763.0	653370.6	ABS-28 (0-0.5)	Original	0	0.5	29.3		Updated Dataset		Miscellaneous Programs
10	ABS-29		1148762.7	653330.1	ABS-29 (0-0.5)	Original	0	0.5	12.6		Updated Dataset		Miscellaneous Programs
10	ABS-3		1148538.8	653108.0	ABS-3 (0-0.25)	Original	0	0.25	0.072	U	Updated Dataset		Miscellaneous Programs
10	ABS-30		1148774.0	653329.3	ABS-30 (0-0.5)	Original	0	0.5	8.1		Updated Dataset		Miscellaneous Programs
10	ABS-31		1148783.0	653323.3	ABS-31 (0-0.5)	Original	0	0.5	5		Updated Dataset		Miscellaneous Programs
10	ABS-32		1148799.2	653361.1	ABS-32 (0-0.5)	Original	0	0.5	17.8		Updated Dataset		Miscellaneous Programs
10	ABS-33		1148820.1	653407.0	ABS-33 (0-0.5)	Original	0	0.5	4.5		Updated Dataset		Miscellaneous Programs
10	ABS-34		1148798.4	653404.6	ABS-34 (0-0.5)	Original	0	0.5	15.1		Updated Dataset		Miscellaneous Programs
10	ABS-35		1148767.4	653279.3	ABS-35 (0-0.5)	Original	0	0.5	5.7		Updated Dataset		Miscellaneous Programs
10	ABS-36		1148760.6	653277.2	ABS-36 (0-0.5)	Original	0	0.5	11.1		Updated Dataset		Miscellaneous Programs
10	ABS-37		1148721.8	653281.5	ABS-37 (0-0.5)	Original	0	0.5	27.1		Updated Dataset		Miscellaneous Programs
10	ABS-4		1148544.1	653166.5	ABS-4 (0-0.5)	Original	0	0.5	0.04		Updated Dataset		Miscellaneous Programs
10	ABS-5		1148597.8	653170.5	ABS-5 (0-0.5)	Original	0	0.5	0.055		Updated Dataset		Miscellaneous Programs
10	ABS-6		1148617.3	653073.0	ABS-6 (0-0.5)	Original	0	0.5	0.25		Updated Dataset		Miscellaneous Programs
10	ABS-7		1148603.8	653008.5	ABS-7 (0-0.5)	Original	0	0.5	0.72		Updated Dataset		Miscellaneous Programs
10	ABS-8		1148652.9	653005.4	ABS-8 (0-0.5)	Original	0	0.5	1		Updated Dataset		Miscellaneous Programs
10	ABS-9		1148671.4	653061.6	ABS-9 (0-0.5)	Original	0	0.5	1.8		Updated Dataset		Miscellaneous Programs
10	CA-1		1148680.0	653650.4	CA-1-0.5-1ft	Original	0.5	1	0.31	J	Updated Dataset		Miscellaneous Programs
10 10	CA-1 CA-10		1148680.0	653650.4	CA-1-0-0.25ft	Original	0 0.5	0.25	0.67	J J	Updated Dataset		Miscellaneous Programs
10	CA-10		1148786.9	653686.8 653686.8	CA-10-0.5-1ft CA-10-0-0.25ft	Original	0.5	0.25	6.77	J J	Updated Dataset Updated Dataset		Miscellaneous Programs
10	CA-10		1148786.9	003000.0	CA-10-0-0.25ft	Original	- 0	0.25	3.29	J	Opdated Dataset		Miscellaneous Programs
10	CA-10		1148786.9	653686.8	dup	Field Duplicate	0	0.25	3.2	J	Updated Dataset		Miscellaneous Programs
10	CA-10-1788-01	CA-10-1788-01	1148824.2	653568.9	S70284	Original	0	0.5	1.06		Both Datasets		Nonresidential OU-1/OU-2 FSP
10							0			J			
	CA-10-1788-01	CA-10-1788-01	1148824.2	653568.9	S70285	Field Duplicate		0.5	1.009	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-1807-02	CA-10-1807-02	1148789.3	653687.1	S70286	Original	0	0.5	6.31	<u> </u>	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-1807-02	CA-10-1807-02	1148789.3	653687.1	S70566	Original	0.5	1	1.87		Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-1807-03	CA-10-1807-03	1148780.4	653740.0	S70287	Original	0	0.5	0.88	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-1912-04	CA-10-1912-04	1148677.1	653805.8	S70288	Original	0	0.5	0.59		Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-1912-05	CA-10-1912-05	1148552.3	653815.7	S70289	Original	0	0.5	0.7		Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-06	CA-10-2049-06	1148315.2	653889.6	S70290	Original	0	0.5	0.331	ļ	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-07	CA-10-2049-07	1148421.8	653938.5	S70291	Original	0	0.5	0.259	ļ	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-08	CA-10-2049-08	1148227.0	654004.3	S70292	Original	0	0.5	0.59	ļ .	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-09	CA-10-2049-09	1148369.9	654059.0	S70293	Original	0	0.5	0.635	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-10	CA-10-2049-10	1148248.6	654267.9	S70294	Original	0	0.5	0.623	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-11	CA 10 2049-11	1148361.8	654359.7	S70295	Original	0	0.5	26.5	-	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-11	CA-10-2049-11	1148361.8	654359.7 654437.6	S70571	Original	0.5	1 0.5	24.3		Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-12 CA-10-2049-12	CA-10-2049-12 CA-10-2049-12	1148378.0 1148378.0	654437.6	S70296 S70576	Original	0.5	0.5 1	39.2 36.8	-	Both Datasets		Nonresidential OU-1/OU-2 FSP Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-12 CA-10-2049-13					Original	0.5			J	Both Datasets		
10	CA-10-2049-13 CA-10-2049-13	CA-10-2049-13 CA-10-2049-13	1148183.7 1148183.7	654537.6 654537.6	S70297 S70581	Original	0.5	0.5 1	65.5 35.4	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-2049-13 CA-10-2133-14	CA-10-2049-13 CA-10-2133-14	1148169.0	654598.1	\$70581 \$70298	Original Original	0.5	0.5	35.4	1	Both Datasets Both Datasets		Nonresidential OU-1/OU-2 FSP Nonresidential OU-1/OU-2 FSP
10	CA-10-2133-14 CA-10-2133-15	CA-10-2133-14 CA-10-2133-15	1148146.1	654734.1	\$70298 \$70299	Original	0	0.5	4.5	1	Both Datasets		Nonresidential OU-1/OU-2 FSP  Nonresidential OU-1/OU-2 FSP
10	UA-10-2133-13	CA-10-2133-13	1140140.1	004734.1	310299	Onginai	U	ບ.ນ	₩.ე	1	טטווו טמומטפוט	I	NOTITE SILICITIAL OUT 1/00-2 FSP

### Attachment 1 Total PCBs Data Summary - CA10 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
10	CA-10-2287-16	CA-10-2287-16	1147913.5	654788.2	S70300	Original	0	0.5	0.58		Both Datasets		Nonresidential OU-1/OU-2 FSP
10	CA-10-SU-1958-A	CA-10-SU-1958-A	1148582.8	652840.1	1958-LA-3A	Original	0	0.25	0.229		Both Datasets	disagreement between coordinates from original and updated datasets	Special Use Sampling
10	CA-10-SU-1958-A	CA-10-SU-1958-A	1148582.8	652840.1	1958-LA-3A-X	Field Duplicate	0	0.25	0.19		Both Datasets	disagreement between coordinates from original and updated datasets	Special Use Sampling
10	CA-10-SU-1958-B	CA-10-SU-1958-B	1148582.8	652840.1	1958-LA-3B	Original	0	0.25	0.088	J	Both Datasets	disagreement between coordinates from original and updated datasets	Special Use Sampling
10	CA-10-SU-1958-C	CA-10-SU-1958-C	1148582.8	652840.1	1958-LA-3C	Original	0	0.25	0.38		Both Datasets	disagreement between coordinates from original and updated datasets	Special Use Sampling
10	CA-11		1148783.4	653711.1	CA-11-0.5-1ft	Original	0.5	1	0.58	J	Updated Dataset		Miscellaneous Programs
10	CA-11		1148783.4	653711.1	CA-11-0-0.25ft	Original	0	0.25	3.75	J	Updated Dataset		Miscellaneous Programs
10	CA-12		1148777.6	653733.7	CA-12-0.5-1ft	Original	0.5	1	0.86	J	Updated Dataset		Miscellaneous Programs
10	CA-12		1148777.6	653733.7	CA-12-0-0.25ft	Original	0	0.25	1.23		Updated Dataset		Miscellaneous Programs
10	CA-12		1148777.6	653733.7	CA-12-0-0.25ft dup	Field Duplicate	0	0.25	1.22		Updated Dataset		Miscellaneous Programs
10	CA-13		1148770.4	653757.8	CA-13-0.5-1ft	Original	0.5	1	0.881	J	Updated Dataset		Miscellaneous Programs
10	CA-13		1148770.4	653757.8	CA-13-0-0.25ft	Original	0	0.25	0.66	J	Updated Dataset		Miscellaneous Programs
10	CA-14		1148815.5	653662.8	CA-14-0.5-1ft	Original	0.5	1	0.351		Updated Dataset		Miscellaneous Programs
10	CA-14		1148815.5	653662.8	CA-14-0-0.25ft	Original	0	0.25	13.6		Updated Dataset		Miscellaneous Programs
10	CA-15		1148808.6	653691.9	CA-15-0.5-1ft	Original	0.5	1	23.5	J	Updated Dataset		Miscellaneous Programs
10	CA-15		1148808.6	653691.9	CA-15-0-0.25f dup	Field Duplicate	0	0.25	14		Updated Dataset		Miscellaneous Programs
10	CA-15		1148808.6	653691.9	CA-15-0-0.25ft	Original	0	0.25	12.7		Updated Dataset		Miscellaneous Programs
10	CA-16		1148800.3	653712.4	CA-16-0.5-1ft	Original	0.5	1	0.087	U	Updated Dataset		Miscellaneous Programs
10	CA-16		1148800.3	653712.4	CA-16-0-0.25ft	Original	0	0.25	4.94	J	Updated Dataset		Miscellaneous Programs
10	CA-17		1148795.2	653740.5	CA-17-0.5-1ft	Original	0.5	1	3.25		Updated Dataset		Miscellaneous Programs
10	CA-17		1148795.2	653740.5	CA-17-0-0.25ft	Original	0	0.25	4.66	J	Updated Dataset		Miscellaneous Programs
10	CA-18		1148789.2	653767.0	CA-18-0.5-1ft	Original	0.5	1	1.333	J	Updated Dataset		Miscellaneous Programs
10	CA-18		1148789.2	653767.0	CA-18-0-0.25ft	Original	0	0.25	1.28	J	Updated Dataset		Miscellaneous Programs
10	CA-19		1148828.9	653665.6	CA-19-0.5-1ft	Original	0.5	1	25.5	J	Updated Dataset		Miscellaneous Programs
10	CA-19		1148828.9	653665.6	CA-19-0-0.25ft	Original	0	0.25	6.98	J	Updated Dataset		Miscellaneous Programs
10	CA-2		1148673.8	653674.5	CA-2-0.5-1ft	Original	0.5	1	0.32		Updated Dataset		Miscellaneous Programs
10	CA-2		1148673.8	653674.5	CA-2-0-0.25ft	Original	0	0.25	0.13	J	Updated Dataset		Miscellaneous Programs
10 10	CA-20 CA-20		1148818.8	653692.1	CA-20-0.5-1ft	Original	0.5 0	1 0.25	5.3 2.93	J	Updated Dataset		Miscellaneous Programs
10	CA-20 CA-21		1148818.8	653692.1	CA-20-0-0.25ft CA-21-0-0.25ft	Original		0.25	2.93	J	Updated Dataset		Miscellaneous Programs
10	CA-21 CA-22		1148813.0 1148805.1	653718.1 653743.5	CA-21-0-0.25ft	Original Original	0	0.25	13.5	J	Updated Dataset Updated Dataset		Miscellaneous Programs Miscellaneous Programs
10	CA-22		1148805.1	653743.5	CA-22-0-0.25ft	Field Duplicate	0	0.25	9.46	J	Updated Dataset		Miscellaneous Programs
10	CA-23		1148800.1	653766.7	dup CA-23-0.5-1ft	Original	0.5	1	0.47		Updated Dataset		Miscellaneous Programs
10	CA-23		1148800.1	653766.7	CA-23-0.5-1ft dup	Field Duplicate	0.5	1	0.33		Updated Dataset		Miscellaneous Programs
					•	·					<u> </u>		· ·
10	CA-23		1148800.1	653766.7	CA-23-0-0.25ft	Original	0	0.25	5.76	J	Updated Dataset		Miscellaneous Programs
10	CA-24		1148623.0	653757.2	CA-24-0.5-1ft	Original	0.5	1	1.2		Updated Dataset		Miscellaneous Programs
10	CA-24		1148623.0	653757.2	CA-24-0-0.25ft	Original	0	0.25	0.18	U	Updated Dataset		Miscellaneous Programs
10	CA-25		1148541.3	653762.0	CA-25-0.5-1ft	Original	0.5	1	0.15	U	Updated Dataset		Miscellaneous Programs
10	CA-25		1148541.3	653762.0	CA-25-0-0.25ft	Original	0	0.25	0.33	U	Updated Dataset		Miscellaneous Programs
10	CA-25		1148541.3	653762.0	CA-25-0-0.25ft dup	Field Duplicate	0	0.25	0.16	U	Updated Dataset		Miscellaneous Programs
10	CA-26		1148765.5	653661.8	CA-26-0.5-1ft	Original	0.5	1	0.084	U	Updated Dataset		Miscellaneous Programs
10	CA-26		1148765.5	653661.8	CA-26-0-0.25ft	Original	0	0.25	0.197		Updated Dataset		Miscellaneous Programs
10	CA-27		1148758.9	653686.1	CA-27-0.5-1ft	Original	0.5		1.8		Updated Dataset		Miscellaneous Programs

### Attachment 1 Total PCBs Data Summary - CA10 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
10	CA-27		1148758.9	653686.1	CA-27-0-0.25ft	Original	0	0.25	0.23	J	Updated Dataset		Miscellaneous Programs
10	CA-27		1148758.9	653686.1	CA-27-0-0.25ft dup	Field Duplicate	0	0.25	0.334	J	Updated Dataset		Miscellaneous Programs
10	CA-28		1148752.6	653710.2	CA-28-0.5-1ft	Original	0.5	1	0.083	U	Updated Dataset		Miscellaneous Programs
10	CA-28		1148752.6	653710.2	CA-28-0-0.25ft	Original	0	0.25	0.081	U	Updated Dataset		Miscellaneous Programs
10	CA-29		1148746.0	653734.4	CA-29-0.5-1ft	Original	0.5	1	0.24		Updated Dataset		Miscellaneous Programs
10	CA-29		1148746.0	653734.4	CA-29-0-0.25ft	Original	0	0.25	0.164		Updated Dataset		Miscellaneous Programs
10	CA-3		1148665.3	653759.4	CA-3-0.5-1ft	Original	0.5	1	0.088	U	Updated Dataset		Miscellaneous Programs
10	CA-3		1148665.3	653759.4	CA-3-0-0.25ft	Original	0	0.25	0.53	J	Updated Dataset		Miscellaneous Programs
10	CA-30		1148739.5	653758.4	CA-30-0.5-1ft	Original	0.5	1	0.146		Updated Dataset		Miscellaneous Programs
10	CA-30		1148739.5	653758.4	CA-30-0-0.25ft	Original	0	0.25	0.064		Updated Dataset		Miscellaneous Programs
10	CA-4		1148732.1	653660.9	CA-4-0.5-1ft	Original	0.5	1	0.086	U	Updated Dataset		Miscellaneous Programs
10	CA-4		1148732.1	653660.9	CA-4-0-0.25ft	Original	0	0.25	0.61		Updated Dataset		Miscellaneous Programs
10	CA-5		1148727.9	653685.4	CA-5-0.5-1ft	Original	0.5	1	0.084	U	Updated Dataset		Miscellaneous Programs
10	CA-5		1148727.9	653685.4	CA-5-0-0.25ft	Original	0	0.25	0.071	U	Updated Dataset		Miscellaneous Programs
10	CA-6		1148724.5	653708.6	CA-6-0.5-1ft	Original	0.5	1	0.086	U	Updated Dataset		Miscellaneous Programs
10	CA-6		1148724.5	653708.6	CA-6-0-0.25ft	Original	0	0.25	0.26	J	Updated Dataset		Miscellaneous Programs
10	CA-7		1148720.1	653734.5	CA-7-0.5-1ft	Original	0.5	1	0.085	U	Updated Dataset		Miscellaneous Programs
10	CA-7		1148720.1	653734.5	CA-7-0-0.25ft	Original	0	0.25	0.594	J	Updated Dataset		Miscellaneous Programs
10	CA-8		1148717.1	653760.5	CA-8-0.5-1ft	Original	0.5	1	0.087	U	Updated Dataset		Miscellaneous Programs
10	CA-8		1148717.1	653760.5	CA-8-0-0.25ft	Original	0	0.25	0.084	U	Updated Dataset		Miscellaneous Programs
10	CA-9		1148794.7	653662.2	CA-9-0.5-1ft	Original	0.5	1	2.96	J	Updated Dataset		Miscellaneous Programs
10	CA-9		1148794.7	653662.2	CA-9-0-0.25ft	Original	0	0.25	21.5	J	Updated Dataset		Miscellaneous Programs
10	CP-C-6		1147939.7	654935.9	CP-C-6-0-3"	Original	0	0.25	4.44		Updated Dataset		Miscellaneous Programs
10	CP-C-6		1147939.7	654935.9	CP-C-6-6-12"	Original	0.5	1	4.78	J	Updated Dataset		Miscellaneous Programs
10	CP-C-7		1147853.7	654924.3	CP-C-7-0-3"	Original	0	0.25	2.51		Updated Dataset		Miscellaneous Programs
10	CP-C-7		1147853.7	654924.3	CP-C-7-0-3"-DUP	Field Duplicate	0	0.25	2.52	J	Updated Dataset		Miscellaneous Programs
10	CP-C-7		1147853.7	654924.3	CP-C-7-6-12"	Original	0.5	1	2.9	J	Updated Dataset		Miscellaneous Programs
10	CP-C-8		1147881.7	654837.1	CP-C-8-0-3"	Original	0	0.25	0.44		Updated Dataset		Miscellaneous Programs
10	CP-C-8		1147881.7	654837.1	CP-C-8-6-12"	Original	0.5	1	0.08	U	Updated Dataset		Miscellaneous Programs
10	PB-024-07	CA-10-EPA-2049- 1001	1148260.8	653780.3	PB-024-07	Original	0	0.25	0.13		Both Datasets		USEPA Programs
10	PB-024-09	CA-10-EPA-2049- 1003	1148380.5	653876.4	PB-024-09	Original	0	0.25	0.05	UJ	Both Datasets		USEPA Programs
10	PB-RRB3-01	CA-10-EPA-43163- 1000	1148173.8	654806.2	PB-RRB3-01	Original	0	0.25	13		Both Datasets		USEPA Programs

Dat Dis

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA11 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth	Depth	Result Value	Qualifier	Dataset	Notes	Program
11	CA-11-2057-03	CA-11-2057-03	1148477.3	654616.6	S70265	Original	Top 0	0.5	0.503		Comparison Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-03	CA-11-2057-03	1148474.0	654671.9	S70265	Original	0	0.5	1.7	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-04 CA-11-2057-05	CA-11-2057-04 CA-11-2057-05	1148438.7	654747.5	S70266	Original	0	0.5	1.48		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-05 CA-11-2057-06	CA-11-2057-05 CA-11-2057-06	1148372.3	654754.1	S70267 S70268	Original	0	0.5	2.37	J	Both Datasets		Nonresidential OU-1/OU-2 FSP  Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-06 CA-11-2057-07	CA-11-2057-06 CA-11-2057-07	1148454.0	654797.8	S70269	Original	0	0.5	3.45	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-07 CA-11-2057-08	CA-11-2057-07 CA-11-2057-08	1148434.0	654834.6	S70269 S70270	Original	0	0.5	1.45		Both Datasets		Nonresidential OU-1/OU-2 FSP  Nonresidential OU-1/OU-2 FSP
						. 9				J			
11	CA-11-2057-09	CA-11-2057-09	1148466.7	654852.9	\$70271 \$70272	Original	0	0.5	0.425		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-10	CA-11-2057-10	1148244.6	654871.9		Original		0.5			Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-11	CA-11-2057-11	1148386.9	654913.9	S70273	Original	0	0.5	1.028	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-12	CA-11-2057-12	1148448.0	654936.0	S70274	Original	0	0.5	0.454		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-13	CA-11-2057-13	1148417.4	654943.4	S70275	Original	0	0.5	1.65	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-14	CA-11-2057-14	1148314.8	654945.0	S70276	Original	0	0.5	0.147		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-15	CA-11-2057-15	1148185.4	654969.1	S70277	Original	0	0.5	0.207		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-16	CA-11-2057-16	1148386.8	654995.3	S70278	Original	0	0.5	0.313	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-16	CA-11-2057-16	1148386.8	654995.3	S70279	Field Duplicate	0	0.5	0.087		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-17	CA-11-2057-17	1148263.8	655023.9	S70280	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2057-18	CA-11-2057-18	1148442.1	655033.3	S70281	Original	0	0.5	0.05		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2200-19	CA-11-2200-19	1148189.5	655169.9	S70282	Original	0	0.5	0.354	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-2209-20	CA-11-2209-20	1148210.0	655242.1	S70283	Original	0	0.5	0.401		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-9999-01	CA-11-9999-01	1147854.3	655287.1	S70263	Original	0	0.5	0.212		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CA-11-9999-02	CA-11-9999-02	1147860.6	655194.1	S70264	Original	0	0.5	1.63		Both Datasets		Nonresidential OU-1/OU-2 FSP
11	CP-C-1		1148332.2	654955.2	CP-C-1-0-3"	Original	0	0.25	0.08	U	Updated Dataset		Miscellaneous Programs
11	CP-C-1		1148332.2	654955.2	CP-C-1-6-12"	Original	0.5	1	0.219		Updated Dataset		Miscellaneous Programs
11	CP-C-2		1148383.0	655016.6	CP-C-2-0-3"	Original	0	0.25	0.087	U	Updated Dataset		Miscellaneous Programs
11	CP-C-2		1148383.0	655016.6	CP-C-2-6-12"	Original	0.5	1	0.08	U	Updated Dataset		Miscellaneous Programs
11	CP-C-3		1148429.7	654893.8	CP-C-3-0-3"	Original	0	0.25	15.8	J	Updated Dataset		Miscellaneous Programs
11	CP-C-3		1148429.7	654893.8	CP-C-3-6-12"	Original	0.5	1	2.44	J	Updated Dataset		Miscellaneous Programs
11	CP-C-4		1148343.9	654859.8	CP-C-4-0-3"	Original	0	0.25	2.08	J	Updated Dataset		Miscellaneous Programs
11	CP-C-4		1148343.9	654859.8	CP-C-4-6-12"	Original	0.5	1	0.234	J	Updated Dataset		Miscellaneous Programs
11	CP-C-5		1148425.4	654691.4	CP-C-5-0-3"	Original	0	0.25	2.56	J	Updated Dataset		Miscellaneous Programs
11	CP-C-5		1148425.4	654691.4	CP-C-5-0-3"-DUP	Field Duplicate	0	0.25	2		Updated Dataset		Miscellaneous Programs
11	CP-C-5		1148425.4	654691.4	CP-C-5-6-12"	Original	0.5	1	0.72	J	Updated Dataset		Miscellaneous Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA12 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
12	CA-12-2737-01	CA-12-2737-01	1147020.5	655577.9	S70099	Original	0	0.5	2.34		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2737-02	CA-12-2737-02	1146804.0	655646.1	S70100	Original	0	0.5	0.18		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2737-03	CA-12-2737-03	1146627.0	655617.2	S70101	Original	0	0.5	1.161		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2737-04	CA-12-2737-04	1146640.5	655796.5	S70102	Original	0	0.5	0.484		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2737-05	CA-12-2737-05	1146546.0	655845.9	S70103	Original	0	0.5	12.8		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2737-05	CA-12-2737-05	1146546.0	655845.9	S70591	Original	0.5	1	1.19		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2737-06	CA-12-2737-06	1146453.0	655880.0	S70104	Original	0	0.5	15.3		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2737-06	CA-12-2737-06	1146453.0	655880.0	S70596	Original	0.5	1	6.27		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2819-07	CA-12-2819-07	1146698.6	655483.5	S70105	Original	0	0.5	19.3		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2819-07	CA-12-2819-07	1146698.6	655483.5	S70601	Original	0.5	1	2.54		Both Datasets		Nonresidential OU-1/OU-2 FSP
12	CA-12-2819-08	CA-12-2819-08	1146899.0	655481.3	S70106	Original	0	0.5	1.17	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
12	PB-009-04	CA-12-EPA-43153-1200	1146755.4	655500.7	PB-009-04	Original	0	0.25	0.05	UJ	Both Datasets		USEPA Programs
12	PB-009-60	CA-12-EPA-43153-1201	1146827.3	655489.0	PB-009-60A	Original	0	0.25	0.05	UJ	Both Datasets		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA13 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
13	CA-13-2598-01	CA-13-2598-01	1147368.2	654809.3	S70107	Original	0	0.5	0.263		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2850-02	CA-13-2850-02	1146775.7	654975.2	S70108	Original	0	0.5	5.5		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2850-02	CA-13-2850-02	1146775.7	654975.2	S70606	Original	0.5	1	2.24		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2850-02	CA-13-2850-02	1146775.7	654975.2	S70775	Field Duplicate	0.5	1	2.39	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2850-03	CA-13-2850-03	1146769.2	655030.4	S70109	Original	0	0.5	4.33		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2875-04	CA-13-2875-04	1146758.7	654627.8	S70110	Original	0	0.5	0.21		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2875-05	CA-13-2875-05	1146797.2	654762.9	S70111	Original	0	0.5	0.263		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2900-08	CA-13-2900-08	1146720.6	655095.6	S70114	Original	0	0.5	0.865		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2900-08	CA-13-2900-08	1146720.6	655095.6	S70115	Field Duplicate	0	0.5	0.66	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2900-09	CA-13-2900-09	1146714.6	655168.8	S70116	Original	0	0.5	7.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2900-09	CA-13-2900-09	1146714.6	655168.8	S70611	Original	0.5	1	8.1		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2900-10	CA-13-2900-10	1146685.5	655212.5	S70117	Original	0	0.5	11.7		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2900-10	CA-13-2900-10	1146685.5	655212.5	S70616	Original	0.5	1	22.9		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2939-06	CA-13-2939-06	1146634.9	654526.3	S70112	Original	0	0.5	0.04	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-2939-07	CA-13-2939-07	1146604.8	654514.6	S70113	Original	0	0.5	0.46		Both Datasets		Nonresidential OU-1/OU-2 FSP
13	CA-13-SU-2875-HA-A	CA-13-SU-2875-HA-A	1146750.8	654679.8	2875-HA-3A	Original	0	0.25	0.134		Original Dataset	Reclassified High Activity Area	Special Use Sampling
13	CA-13-SU-2875-LA-B	CA-13-SU-2875-LA-B	1146750.8	654679.8	2875-LA-3B	Original	0	0.25	0.181		Both Datasets		Special Use Sampling
13	CA-13-SU-2875-LA-C	CA-13-SU-2875-LA-C	1146750.8	654679.8	2875-LA-3C	Original	0	0.25	0.194		Both Datasets		Special Use Sampling
13	FC3-0063-D		1146878.9	654919.0	FC3-0063-D	Original	0	0.25	0.22		Updated Dataset		Residential Sampling

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)
J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan
OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA14 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
14 North	3053-A		1146263.0	655830.0	3053-3A	Original	0	0.25	12.8		Updated Dataset		Miscellaneous Programs
14 North	3053-B		1146355.0	655791.0	3053-3B	Original	0	0.25	28.9	J	Updated Dataset		Miscellaneous Programs
14 North	3053-C		1146273.0	655931.0	3053-3C	Original	0	0.25	7.53		Updated Dataset		Miscellaneous Programs
14 North	3053-C		1146273.0	655931.0	3053-3C-X	Field Duplicate	0	0.25	6.78		Updated Dataset		Miscellaneous Programs
14 North	3053-D		1146251.0	656004.0	3053-3D	Original	0	0.25	14.1		Updated Dataset		Miscellaneous Programs
14 North	CA-14-3002-01	CA-14-3002-01	1146501.0	655558.1	S70118	Original	0	0.5	3.94	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-02	CA-14-3053-02	1146336.9	655759.3	S70119	Original	0	0.5	15.5		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-02	CA-14-3053-02	1146336.9	655759.3	S70621	Original	0.5	1	28		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-03	CA-14-3053-03	1146362.0	655806.1	S70120	Original	0	0.5	46		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-03	CA-14-3053-03	1146362.0	655806.1	S70121	Field Duplicate	0	0.5	36	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-03	CA-14-3053-03	1146362.0	655806.1	S70626	Original	0.5	1	11.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-04	CA-14-3053-04	1146235.9	655888.9	S70122	Original	0	0.5	1.143	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-05	CA-14-3053-05	1146283.2	655918.4	S70123	Original	0	0.5	6.69	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-05	CA-14-3053-05	1146283.2	655918.4	S70631	Original	0.5	1	8.42		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-06	CA-14-3053-06	1146199.9	656047.2	S70124	Original	0	0.5	11.21		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3053-06	CA-14-3053-06	1146199.9	656047.2	S70636	Original	0.5	1	5.56	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3189-08	CA-14-3189-08	1145984.0	655969.5	S70126	Original	0	0.5	2.02		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3189-09	CA-14-3189-09	1146078.6	655992.3	S70127	Original	0	0.5	1.074		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3189-10	CA-14-3189-10	1145931.0	655999.0	S70128	Original	0	0.5	21.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3189-10	CA-14-3189-10	1145931.0	655999.0	S70641	Original	0.5	1	45.2	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 North	CA-14-3189-12	CA-14-3189-12	1146061.0	656051.0	S70130	Original	0	0.5	3.5		Both Datasets		Nonresidential OU-1/OU-2 FSP

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA14 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
14 South	CA-14-3189-07	CA-14-3189-07	1145778.9	655934.0	S70125	Original	0	0.5	0.119		Original Dataset	Reclassified High Activity Area	OU-1/OU-2 Nonresidential FSP
14 South	CA-14-3189-11	CA-14-3189-11	1145829.9	656034.1	S70129	Original	0	0.5	0.537		Original Dataset	Reclassified High Activity Area	OU-1/OU-2 Nonresidential FSP
14 South	CA-14-3349-13	CA-14-3349-13	1145861.4	655473.8	S70131	Original	0	0.5	0.16	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 South	CA-14-3376-14	CA-14-3376-14	1145796.0	655629.6	S70132	Original	0	0.5	0.038	U	Original Dataset	Residential location/sample	OU-1/OU-2 Non-Residential FSP
14 South	CA-14-9999-15	CA-14-9999-15	1145759.9	656135.1	S70133	Original	0	0.5	0.054		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 South	CA-14-9999-16	CA-14-9999-16	1145912.0	656168.0	S70134	Original	0	0.5	0.438		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 South	CA-14-9999-17	CA-14-9999-17	1145766.1	656253.7	S70135	Original	0	0.5	0.066		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 South	CA-14-9999-18	CA-14-9999-18	1145336.5	656573.4	S70136	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 South	CA-14-9999-19	CA-14-9999-19	1145272.6	656623.5	S70137	Original	0	0.5	0.388		Both Datasets		Nonresidential OU-1/OU-2 FSP
14 South	CA-14-9999-20	CA-14-9999-20	1145139.9	656681.1	S70138	Original	0	0.5	0.285	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
14 South	CA-14-SU-3368-A	CA-14-SU-3368-A	1145780.0	655825.8	3368-HA-3A	Original	0	0.25	0.24		Original Dataset	Reclassified High Activity Area	Special Use Sampling
14 South	CA-14-SU-3368-A	CA-14-SU-3368-A	1145780.0	655825.8	3368-HA-3A-X	Field Duplicate	0	0.25	0.192		Original Dataset	Reclassified High Activity Area	Special Use Sampling
14 South	CA-14-SU-3368-B	CA-14-SU-3368-B	1145780.0	655825.8	3368-LA-3B	Original	0	0.25	0.107		Both Datasets		Special Use Sampling
14 South	CA-14-SU-3368-C	CA-14-SU-3368-C	1145780.0	655825.8	3368-LA-3C	Original	0	0.25	0.074	U	Original Dataset	Remediated	Special Use Sampling
14 South	CA-14-SU-3368-D	CA-14-SU-3368-D	1145780.0	655825.8	3368-LA-3D	Original	0	0.25	0.098		Original Dataset	Reclassified High Activity Area	Special Use Sampling
14 South	CA-14-SU-3368-E	CA-14-SU-3368-E	1145780.0	655825.8	3368-LA-3E	Original	0	0.25	1.29		Original Dataset	Reclassified High Activity Area	Special Use Sampling
14 South	CA-14-SU-3368-F	CA-14-SU-3368-F	1145780.0	655825.8	3368-LA-3F	Original	0	0.25	17.2		Original Dataset	Reclassified High Activity Area	Special Use Sampling
14 South	CA-14-SU-3368-G	CA-14-SU-3368-G	1145780.0	655825.8	3368-LA-3G	Original	0	0.25	1.68	J	Both Datasets		Special Use Sampling
14 South	CA-14-SU-3368-H		1145780.0	655825.8	3368-LA-3H	Original	0	0.25	1.73		Updated Dataset		Special Use Sampling
14 South	CA-14-SU-3368-I		1145780.0	655825.8	3368-LA-3I	Original	0	0.25	0.88		Updated Dataset		Special Use Sampling

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA16 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
15/16	3145-G		1145978.4	657128.0	3145-LA-3G	Original	0	0.25	0.327		Updated Dataset		Special Use Sampling
15/16	3145-G		1145978.4	657128.0	3145-LA-3G-X	Field Duplicate	0	0.25	0.307	J	Updated Dataset		Special Use Sampling
15/16	3145-H		1145978.4	657128.0	3145-LA-3H	Original	0	0.25	0.41	J	Updated Dataset		Special Use Sampling
15/16	3145-I		1145978.4	657128.0	3145-LA-3I	Original	0	0.25	0.317	J	Updated Dataset		Special Use Sampling
15/16	3145-J		1145978.4	657128.0	3145-LA-3J	Original	0	0.25	0.373	J	Updated Dataset		Special Use Sampling
15/16	CA-15-2550-01	CA-15-2550-01	1147411.9	655552.9	S70139	Original	0	0.5	0.049		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-02	CA-15-2550-02	1147451.0	655652.2	S70140	Original	0	0.5	0.253		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-03	CA-15-2550-03	1147175.9	655692.0	S70141	Original	0	0.5	0.1		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-04	CA-15-2550-04	1147022.1	655821.2	S70142	Original	0	0.5	0.28		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-05	CA-15-2550-05	1146731.9	655949.1	S70143	Original	0	0.5	0.09		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-06	CA-15-2550-06	1147446.0	655964.0	S70144	Original	0	0.5	0.314		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-07	CA-15-2550-07	1147469.1	656114.1	S70145	Original	0	0.5	2.6		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-08	CA-15-2550-08	1146575.0	656164.0	S70146	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-09	CA-15-2550-09	1147216.1	656175.3	S70147	Original	0	0.5	0.171		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-10	CA-15-2550-10	1147015.7	656179.9	S70148	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-11	CA-15-2550-11	1146842.2	656282.9	S70149	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-12	CA-15-2550-12	1146664.8	656344.1	S70150	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-13	CA-15-2550-13	1146962.1	656343.0	S70151	Original	0	0.5	1.24		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-2550-14	CA-15-2550-14	1146533.9	656401.0	S70152	Original	0	0.5	1.3		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-3016-15	CA-15-3016-15	1146426.0	656254.0	S70153	Original	0	0.5	0.037		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-3016-16	CA-15-3016-16	1146307.0	656364.0	S70154	Original	0	0.5	0.93		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-3016-17	CA-15-3016-17	1146173.1	656484.1	S70155	Original	0	0.5	4.69		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-3016-17	CA-15-3016-17	1146173.1	656484.1	S70156	Field Duplicate	0	0.5	4.48		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-3172-18	CA-15-3172-18	1146129.0	656273.6	S70157	Original	0	0.5	3.09		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-3172-19	CA-15-3172-19	1145994.9	656394.0	S70158	Original	0	0.5	0.086		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-15-3172-20	CA-15-3172-20	1145755.9	656514.0	S70159	Original	0	0.5	0.095		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2787-01	CA-16-2787-01	1146840.4	656883.9	S70301	Original	0	0.5	0.041	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2883-02	CA-16-2883-02	1146612.0	656923.6	S70302	Original	0	0.5	0.04	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2883-03	CA-16-2883-03	1146702.0	657002.5	S70303	Original	0	0.5	0.041		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2883-04	CA-16-2883-04	1146641.2	657126.9	S70304	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2883-05	CA-16-2883-05	1146606.4	657182.9	S70305	Original	0	0.5	0.057		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2883-06	CA-16-2883-06	1146742.2	657221.6	S70306	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2940-07	CA-16-2940-07	1146618.9	656616.0	S70307	Original	0	0.5	0.258	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2940-07	CA-16-2940-07	1146618.9	656616.0	S70308	Field Duplicate	0	0.5	0.222	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-2940-08	CA-16-2940-08	1146589.5	656735.7	S70309	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3009-09	CA-16-3009-09	1146424.9	657170.6	S70310	Original	0	0.5	0.132		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3014-10	CA-16-3014-10	1146243.8	656776.1	S70311	Original	0	0.5	4.08		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3144-11	CA-16-3144-11	1146178.2	656727.2	S70312	Original	0	0.5	0.49		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3144-12	CA-16-3144-12	1146113.4	656916.7	S70313	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3145-13	CA-16-3145-13	1145811.5	657133.9	S70314	Original	0	0.5	0.66		Original Dataset	Reclassified High Activity Area	OU-1/OU-2 Nonresidential FSP
15/16	CA-16-3145-14	CA-16-3145-14	1145745.3	657180.2	S70315	Original	0	0.5	0.46		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3210-15	CA-16-3210-15	1146074.5	656724.7	S70316	Original	0	0.5	0.346	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3210-16	CA-16-3210-16	1146000.0	656813.7	S70317	Original	0	0.5	0.049		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3210-17	CA-16-3210-17	1145967.2	656897.4	S70318	Original	0	0.5	0.163		Both Datasets		Nonresidential OU-1/OU-2 FSP
15/16	CA-16-3367-18	CA-16-3367-18	1145789.3	656834.5	S70319	Original	0	0.5	0.3		Original Dataset	Reclassified High Activity Area	OU-1/OU-2 Nonresidential FSP
15/16	CA-16-8561-19	CA-16-8561-19	1146346.9	657130.1	S70320	Original	0	0.5	4.09		Both Datasets	7.100	Nonresidential OU-1/OU-2 FSP
15/16	CA-16-8561-20	CA-16-8561-20	1146256.9	657212.7	S70321	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
		CA-16-SU-3145-HA-A		657128.0	3145-HA-3A	Original	0	0.25	0.205		Original Dataset	Reclassified High Activity Area	Special Use Sampling
15/16	CA-16-SU-3145-HA-B	CA-16-SU-3145-HA-B	1145978.4	657128.0	3145-HA-3B	Original	0	0.25	0.71		Original Dataset	Reclassified High Activity Area	Special Use Sampling

### Attachment 1 Total PCBs Data Summary - CA16 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
15/16	CA-16-SU-3145-HA-C	CA-16-SU-3145-HA-C	1145978.4	657128.0	3145-HA-3C	Original	0	0.25	2.32		Original Dataset	Reclassified High Activity Area	Special Use Sampling
15/16	CA-16-SU-3145-HA-D	CA-16-SU-3145-HA-D	1145978.4	657128.0	3145-HA-3D	Original	0	0.25	0.35		Original Dataset	Reclassified High Activity Area	Special Use Sampling
15/16	CA-16-SU-3145-LA-E	CA-16-SU-3145-LA-E	1145978.4	657128.0	3145-LA-3E	Original	0	0.25	0.075	U	Both Datasets		Special Use Sampling
15/16	CA-16-SU-3145-LA-F	CA-16-SU-3145-LA-F	1145978.4	657128.0	3145-LA-3F	Original	0	0.25	0.046		Both Datasets		Special Use Sampling

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA17 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth	Depth	Result	Qualifier	Dataset	Notes	Program
L		_			•	,	Top	Bottom	Value		Comparison		· ·
17	CA-17-3450-01	CA-17-3450-01	1145604.8	656813.0	S70322	Original	0	0.5	0.169		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3536-02	CA-17-3536-02	1145532.3	656999.0	S70323	Original	0	0.5	0.28		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3536-03	CA-17-3536-03	1145418.7	657091.8	S70324	Original	0	0.5	10.17		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3536-03	CA-17-3536-03	1145418.7	657091.8	S70646	Original	0.5	1	0.42		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3536-03	CA-17-3536-03	1145418.7	657091.8	S70779	Field Duplicate	0.5	1	0.392		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3536-04	CA-17-3536-04	1145511.2	657222.3	S70325	Original	0	0.5	2.13		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3592-05	CA-17-3592-05	1145378.1	657399.0	S70326	Original	0	0.5	1.95		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3658-06	CA-17-3658-06	1145248.7	657333.8	S70327	Original	0	0.5	0.461		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3691-07	CA-17-3691-07	1145274.4	656788.1	S70328	Original	0	0.5	0.137	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3794-08	CA-17-3794-08	1145185.4	657431.3	S70329	Original	0	0.5	0.486		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3795-09	CA-17-3795-09	1145165.4	656915.1	S70330	Original	0	0.5	4.23		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3795-10	CA-17-3795-10	1145038.7	656940.4	S70331	Original	0	0.5	2.17		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3795-11	CA-17-3795-11	1144858.0	657079.8	S70332	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-3795-12	CA-17-3795-12	1144708.1	657195.7	S70333	Original	0	0.5	0.797		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4011-13	CA-17-4011-13	1144649.3	656974.0	S70334	Original	0	0.5	13.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4011-13	CA-17-4011-13	1144649.3	656974.0	S70651	Original	0.5	1	3.1		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4011-14	CA-17-4011-14	1144565.2	657048.8	S70335	Original	0	0.5	12		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4011-15	CA-17-4011-15	1144306.6	657051.7	S70336	Original	0	0.5	0.869		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4011-16	CA-17-4011-16	1144156.0	657073.6	S70337	Original	0	0.5	3.51	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4011-16	CA-17-4011-16	1144156.0	657073.6	S70338	Field Duplicate	0	0.5	3.48		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4011-17	CA-17-4011-17	1143984.5	657078.8	S70339	Original	0	0.5	1.32		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4011-18	CA-17-4011-18	1144203.6	657181.7	S70340	Original	0	0.5	3.13	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4274-19	CA-17-4274-19	1144240.7	657443.0	S70341	Original	0	0.5	0.27		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4274-20	CA-17-4274-20	1144315.1	657507.3	S70342	Original	0	0.5	0.09		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4274-21	CA-17-4274-21	1144041.9	657634.1	S70343	Original	0	0.5	0.047		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4274-22	CA-17-4274-22	1144060.7	657777.8	S70344	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-4559-23	CA-17-4559-23	1143855.7	657290.2	S70345	Original	0	0.5	5.27		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	CA-17-8618-24	CA-17-8618-24	1145585.6	656697.6	S70346	Original	0	0.5	0.16		Both Datasets		Nonresidential OU-1/OU-2 FSP
17	PB-RRB1-03	CA-17-EPA-43163-1700	1144541.9	657145.7	PB-RRB1-03	Original	0	0.25	0.05	UJ	Both Datasets		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA18 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
18	CA-18-4697-01	CA-18-4697-01	1143457.0	658034.9	S70160	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-4749-02	CA-18-4749-02	1143402.0	657564.9	S70161	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-4768-03	CA-18-4768-03	1143310.2	658189.0	S70162	Original	0	0.5	0.072		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-4820-04	CA-18-4820-04	1143114.0	658268.0	S70163	Original	0	0.5	0.343		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-4880-05	CA-18-4880-05	1143101.0	657983.0	S70164	Original	0	0.5	0.154	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5015-06	CA-18-5015-06	1142855.7	658392.8	S70165	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5020-07	CA-18-5020-07	1142681.9	658026.1	S70166	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5068-08	CA-18-5068-08	1142614.5	657784.5	S70167	Original	0	0.5	0.142		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5129-09	CA-18-5129-09	1142570.2	657790.9	S70168	Original	0	0.5	0.48	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5231-10	CA-18-5231-10	1142158.7	657800.5	S70169	Original	0	0.5	0.097		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5231-11	CA-18-5231-11	1142371.7	657885.2	S70170	Original	0	0.5	1.05		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5263-12	CA-18-5263-12	1142234.8	658061.5	S70171	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5263-13	CA-18-5263-13	1142201.8	658254.1	S70172	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5370-14	CA-18-5370-14	1141992.8	657777.0	S70173	Original	0	0.5	0.41	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5483-15	CA-18-5483-15	1141635.5	657984.9	S70174	Original	0	0.5	0.427		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5483-16	CA-18-5483-16	1141533.1	658036.0	S70175	Original	0	0.5	0.072		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5486-17	CA-18-5486-17	1141632.8	657748.0	S70176	Original	0	0.5	0.418		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5486-18	CA-18-5486-18	1141486.8	657763.8	S70177	Original	0	0.5	0.23	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5486-18	CA-18-5486-18	1141486.8	657763.8	S70178	Field Duplicate	0	0.5	0.1	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-5525-19	CA-18-5525-19	1141237.5	658051.1	S70179	Original	0	0.5	0.191		Both Datasets		Nonresidential OU-1/OU-2 FSP
18	CA-18-SU-5043-LA-A		1142704.5	657905.7	5043-LA-3A	Original	0	0.25	0.08	U	Updated Dataset		Special Use Sampling
18	CA-18-SU-5043-LA-B		1142704.5	657905.7	5043-LA-3B	Original	0	0.25	0.045		Updated Dataset		Special Use Sampling
18	CA-18-SU-5043-LA-C		1142704.5	657905.7	5043-LA-3C	Original	0	0.25	0.345		Updated Dataset		Special Use Sampling
18	PB-RRB1-01	CA-18-EPA-43163-1800	1142602.2	657523.6	PB-RRB1-01	Original	0	0.25	0.05	UJ	Both Datasets		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA19 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
19	CA-19-4559-01	CA-19-4559-01	1143628.9	657326.9	S70180	Original	0	0.5	8.5		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-4559-01	CA-19-4559-01	1143628.9	657326.9	S70656	Original	0.5	1	4.28		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-4559-02	CA-19-4559-02	1143254.0	657338.8	S70181	Original	0	0.5	0.89		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-4559-03	CA-19-4559-03	1143197.8	657358.9	S70182	Original	0	0.5	2.75		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-4559-90	CA-19-EPA-4011-1905	1143142.3	657388.8	PB-010-08	Original	0	0.25	8.9		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-4559-90	CA-19-4559-90	1143142.3	657388.8	S70661	Original	0.5	1	1.86		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-4559-92	CA-19-EPA-4011-1908	1143564.0	657356.6	PB-010-07	Original	0	0.25	7.7		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-4559-92	CA-19-4559-92	1143564.0	657356.6	S70666	Original	0.5	1	9.53		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-13	CA-19-8560-13	1143753.0	657116.9	S70193	Original	0	0.5	4.8		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-14	CA-19-8560-14	1143514.1	657195.0	S70194	Original	0	0.5	3.89		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-15	CA-19-8560-15	1143300.9	657209.9	S70195	Original	0	0.5	1530		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-15	CA-19-8560-15	1143300.9	657209.9	S70676	Original	0.5	1	0.56		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-16	CA-19-8560-16	1143111.7	657234.6	S70196	Original	0	0.5	139		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-16	CA-19-8560-16	1143111.7	657234.6	S70681	Original	0.5	1	196		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-17	CA-19-8560-17	1143680.0	657253.0	S70197	Original	0	0.5	5.8		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-18	CA-19-8560-18	1143442.6	657315.4	S70198	Original	0	0.5	2.28		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-91	CA-19-EPA-4011-1907	1143514.6	657167.6	PB-010-06	Original	0	0.25	8.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8560-91	CA-19-8560-91	1143514.6	657167.6	S70686	Original	0.5	1	27		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	PB-RRB2-01	CA-19-EPA-43163-1906	1143257.1	657416.9	PB-RRB2-01	Original	0	0.25	15	J	Both Datasets		USEPA Programs

Data were new additions to dataset.
Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA19 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
19	CA-19-5156-04	CA-19-5156-04	1142139.8	657439.9	S70183	Original	0	0.5	0.117	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-5156-05	CA-19-5156-05	1142325.1	657443.9	S70184	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-5347-06	CA-19-5347-06	1142023.2	657465.6	S70185	Original	0	0.5	0.32		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-5347-06	CA-19-5347-06	1142023.2	657465.6	S70186	Field Duplicate	0	0.5	0.187		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-5347-07	CA-19-5347-07	1141910.4	657468.2	S70187	Original	0	0.5	28		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-5347-07	CA-19-5347-07	1141910.4	657468.2	S70671	Original	0.5	1	89		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-5347-08	CA-19-5347-08	1141397.9	657497.0	S70188	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-5347-09	CA-19-5347-09	1141708.3	657493.6	S70189	Original	0	0.5	0.284		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-5347-10	CA-19-5347-10	1141515.9	657518.1	S70190	Original	0	0.5	0.255	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8558-11	CA-19-8558-11	1141204.0	657348.9	S70191	Original	0	0.5	0.054		Both Datasets		Nonresidential OU-1/OU-2 FSP
19	CA-19-8558-12	CA-19-8558-12	1141017.0	657416.0	S70192	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
19	PB-021-02	CA-19-EPA-5347-1903	1141768.0	657385.0	PB-021-02	Original	0	0.25	0.17	J	Both Datasets		USEPA Programs
19	PB-021-04	CA-19-EPA-5347-1901	1141382.8	657525.1	PB-021-04	Original	0	0.25	0.05	UJ	Both Datasets		USEPA Programs
19	PB-021B-01		1140940.1	657523.2	PB-021B-01	Original	0	0.25	0.19	J	Updated Dataset	·	USEPA Programs
19	PB-RRB2-04	CA-19-EPA-43163-1902	1141722.2	657550.4	PB-RRB2-04	Original	0	0.25	53	J	Both Datasets		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA20 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
20	CA-20-4643-01	CA-20-4643-01	1143412.3	656935.7	S70424	Original	0	0.5	0.051		Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-4643-01	CA-20-4643-01	1143412.3	656935.7	S70425	Field Duplicate	0	0.5	0.044		Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-4643-02	CA-20-4643-02	1143539.8	656935.9	S70426	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-4643-03	CA-20-4643-03	1143278.1	657028.1	S70427	Original	0	0.5	0.36	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-4876-04	CA-20-4876-04	1143164.2	656930.6	S70428	Original	0	0.5	0.2		Original Dataset	Residential location/sample	OU-1/OU-2 Nonresidential FSP
20	CA-20-4876-05	CA-20-4876-05	1142863.0	656876.0	S70429	Original	0	0.5	0.083		Original Dataset	Residential location/sample	OU-1/OU-2 Nonresidential FSP
20	CA-20-4876-06	CA-20-4876-06	1143000.7	656845.4	S70430	Original	0	0.5	0.044	U	Original Dataset	Residential location/sample	OU-1/OU-2 Nonresidential FSP
20	CA-20-4890-07	CA-20-4890-07	1143129.7	657035.3	S70431	Original	0	0.5	0.303	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-4890-08	CA-20-4890-08	1143078.8	657057.6	S70432	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-5368-09	CA-20-5368-09	1141990.0	657266.0	S70433	Original	0	0.5	0.187		Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-5368-10	CA-20-5368-10	1141955.4	657152.7	S70434	Original	0	0.5	6.34	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-5368-10	CA-20-5368-10	1141955.4	657152.7	S70691	Original	0.5	1	3.61		Both Datasets		Nonresidential OU-1/OU-2 FSP
20	CA-20-RES-4876-A	CA-20-RES-4876-A	1143016.3	656902.2	4876-3A	Original	0	0.25	0.148		Original Dataset	Residential location/sample	Residential Sampling
20	CA-20-RES-4876-B	CA-20-RES-4876-B	1143016.3	656902.2	4876-3B	Original	0	0.25	0.04	U	Original Dataset	Residential location/sample	Residential Sampling
20	CA-20-RES-4876-C	CA-20-RES-4876-C	1143016.3	656902.2	4876-3C	Original	0	0.25	0.039	C	Original Dataset	Residential location/sample	Residential Sampling
20	CA-20-RES-4876-D	CA-20-RES-4876-D	1143016.3	656902.2	4876-3D	Original	0	0.25	0.038	Ü	Original Dataset	Residential location/sample	Residential Sampling

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA21 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
21	CA-21-5566-01	CA-21-5566-01	1141092.1	658327.9	S70347	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5566-02	CA-21-5566-02	1141020.6	658530.0	S70348	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5566-03	CA-21-5566-03	1141162.5	658526.1	S70349	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5571-04	CA-21-5571-04	1140864.4	657731.7	S70350	Original	0	0.5	0.202		Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5571-05	CA-21-5571-05	1140970.9	657734.5	S70351	Original	0	0.5	0.053	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5571-06	CA-21-5571-06	1140612.0	657707.9	S70352	Original	0	0.5	0.229	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5571-07	CA-21-5571-07	1140778.7	657723.6	S70353	Original	0	0.5	0.131		Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5571-08	CA-21-5571-08	1140549.5	658043.9	S70354	Original	0	0.5	0.04	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5571-09	CA-21-5571-09	1140914.2	658086.6	S70355	Original	0	0.5	0.04	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5571-10	CA-21-5571-10	1140687.0	658067.4	S70356	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5603-11	CA-21-5603-11	1140916.2	658217.7	S70357	Original	0	0.5	0.088		Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5603-12	CA-21-5603-12	1140862.0	658302.1	S70358	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5657-13	CA-21-5657-13	1140690.4	658128.8	S70359	Original	0	0.5	0.154		Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5657-14	CA-21-5657-14	1140478.5	658284.1	S70360	Original	0	0.5	2.74	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5730-15	CA-21-5730-15	1140124.2	657982.5	S70361	Original	0	0.5	0.042		Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5734-16	CA-21-5734-16	1140143.2	658082.7	S70362	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5734-16	CA-21-5734-16	1140143.2	658082.7	S70363	Field Duplicate	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5755-17	CA-21-5755-17	1140019.6	658244.8	S70364	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5761-18	CA-21-5761-18	1139983.4	658070.7	S70365	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-5761-19	CA-21-5761-19	1139806.5	658231.3	S70366	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
21	CA-21-8541-20	CA-21-8541-20	1141122.1	658112.1	S70367	Original	0	0.5	0.044	U	Both Datasets		Nonresidential OU-1/OU-2 FSP

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA22 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
22	CA-22-5619-01	CA-22-5619-01	1140654.9	657281.1	S70377	Original	0	0.5	0.054	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5621-02	CA-22-5621-02	1140508.2	657363.1	S70378	Original	0	0.5	0.173		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5621-03	CA-22-5621-03	1140875.8	657454.9	S70379	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5621-04	CA-22-5621-04	1140637.8	657456.0	S70380	Original	0	0.5	0.048		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5621-05	CA-22-5621-05	1140737.4	657527.4	S70381	Original	0	0.5	10.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5621-05	CA-22-5621-05	1140737.4	657527.4	S70696	Original	0.5	1	0.094	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5697-06	CA-22-5697-06	1140059.2	657161.5	S70382	Original	0	0.5	0.04	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5697-07	CA-22-5697-07	1140234.3	657291.1	S70383	Original	0	0.5	0.034	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5702-08	CA-22-5702-08	1140422.2	657307.0	S70405	Original	0	0.5	0.058		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5702-09	CA-22-5702-09	1139977.5	657411.7	S70384	Original	0	0.5	0.209		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5702-09	CA-22-5702-09	1139977.5	657411.7	S70385	Field Duplicate	0	0.5	0.26		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5764-10	CA-22-5764-10	1139739.1	657107.0	S70386	Original	0	0.5	0.419		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5764-10	CA-22-5764-10	1139739.1	657107.0	S70387	Field Duplicate	0	0.5	0.355		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5764-11	CA-22-5764-11	1139511.3	657274.4	S70388	Original	0	0.5	0.256		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5837-12	CA-22-5837-12	1139454.5	657158.9	S70389	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5837-13	CA-22-5837-13	1139235.9	657324.7	S70390	Original	0	0.5	0.037		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5932-14	CA-22-5932-14	1138589.7	656883.7	S70391	Original	0	0.5	30.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5932-14	CA-22-5932-14	1138589.7	656883.7	S70701	Original	0.5	1	0.1		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5932-15	CA-22-5932-15	1138558.5	657096.7	S70392	Original	0	0.5	0.416		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5932-16	CA-22-5932-16	1138743.7	657271.6	S70393	Original	0	0.5	0.12		Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5981-17	CA-22-5981-17	1138191.9	656778.4	S70394	Original	0	0.5	0.041	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
22	CA-22-5981-18	CA-22-5981-18	1138047.7	656805.0	S70395	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
22	PB-002-01		1139491.2	657364.9	PB-002-01	Original	0	0.25	0.05	UJ	Updated Dataset		USEPA Programs
22	PB-002-04	CA-22-EPA-5837-2204	1139157.2	657152.1	PB-002-04	Original	0	0.25	0.05	UJ	Both Datasets		USEPA Programs
22	PB-002-05	CA-22-EPA-5837-2205	1139202.3	656960.3	PB-002-05	Original	0	0.25	0.065		Both Datasets		USEPA Programs
22	PB-003-01	CA-22-EPA-5887-2200	1138829.9	656881.4	PB-003-01	Original	0	0.25	0.05	U	Both Datasets		USEPA Programs
22	PB-003-03	CA-22-EPA-5887-2203	1139133.3	656946.6	PB-003-03	Original	0	0.25	0.18		Both Datasets		USEPA Programs
22	PB-003-06	CA-22-EPA-5887-2201	1138882.0	657320.7	PB-003-06	Original	0	0.25	0.36		Both Datasets		USEPA Programs
22	PB-021B-03	CA-22-EPA-5347-2206	1140451.3	657465.5	PB-021B-03	Original	0	0.25	0.4		Both Datasets		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA23 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
23	CA-23-5801-01	CA-23-5801-01	1138971.0	657813.9	S70199	Original	0	0.5	0.096		Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5801-02	CA-23-5801-02	1139082.9	657581.0	S70200	Original	0	0.5	0.27		Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5801-03	CA-23-5801-03	1139178.9	657861.0	S70201	Original	0	0.5	1.21		Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5801-04	CA-23-5801-04	1139186.0	657761.5	S70202	Original	0	0.5	0.131		Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5801-05	CA-23-5801-05	1139390.9	657897.2	S70203	Original	0	0.5	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5801-06	CA-23-5801-06	1139497.8	657618.7	S70204	Original	0	0.5	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5801-07	CA-23-5801-07	1139597.1	657938.0	S70205	Original	0	0.5	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5801-08	CA-23-5801-08	1139709.0	657706.1	S70206	Original	0	0.5	0.089		Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5801-09	CA-23-5801-09	1139758.3	658030.8	S70207	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5809-10	CA-23-5809-10	1138971.0	657987.0	S70208	Original	0	0.5	0.041	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5809-11	CA-23-5809-11	1139151.9	658007.4	S70209	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5811-12	CA-23-5811-12	1139636.7	658263.2	S70210	Original	0	0.5	0.039		Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5910-13	CA-23-5910-13	1138866.1	657550.0	S70211	Original	0	0.5	0.213	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5912-14	CA-23-5912-14	1138762.0	657876.0	S70212	Original	0	0.5	0.51		Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5912-15	CA-23-5912-15	1138768.9	657827.1	S70213	Original	0	0.5	0.151		Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5912-16	CA-23-5912-16	1138837.0	657730.1	S70214	Original	0	0.5	1.195	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5912-16	CA-23-5912-16	1138837.0	657730.1	S70215	Field Duplicate	0	0.5	0.75	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5939-17	CA-23-5939-17	1138457.1	657642.9	S70216	Original	0	0.5	0.034	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5939-18	CA-23-5939-18	1138553.9	657737.0	S70217	Original	0	0.5	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5939-19	CA-23-5939-19	1138560.8	657904.7	S70218	Original	0	0.5	0.035	Ü	Both Datasets		Nonresidential OU-1/OU-2 FSP
23	CA-23-5939-20	CA-23-5939-20	1138658.0	657690.0	S70219	Original	0	0.5	0.193		Both Datasets		Nonresidential OU-1/OU-2 FSP

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA24 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
24	CA-24-5994-01	CA-24-5994-01	1138212.0	657566.1	S70435	Original	0	0.5	7.77	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-5994-01	CA-24-5994-01	1138212.0	657566.1	S70706	Original	0.5	1	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-5994-02	CA-24-5994-02	1138278.0	658168.0	S70436	Original	0	0.5	0.128		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6004-03	CA-24-6004-03	1137805.9	657445.3	S70437	Original	0	0.5	11.6		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6004-03	CA-24-6004-03	1137805.9	657445.3	S70438	Field Duplicate	0	0.5	9.6		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6004-04	CA-24-6004-04	1137924.1	657452.8	S70439	Original	0	0.5	13		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6004-04	CA-24-6004-04	1137924.1	657452.8	S70716	Original	0.5	1	2.35	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6004-04	CA-24-6004-04	1137924.1	657452.8	S70787	Field Duplicate	0.5	1	1.94		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6004-05	CA-24-6004-05	1138107.0	657486.9	S70440	Original	0	0.5	4.84		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6004-07	CA-24-6004-07	1138003.1	657543.9	S70442	Original	0	0.5	2.91		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-09	CA-24-6098-09	1137278.6	657382.6	S70444	Original	0	0.5	5.5		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-10	CA-24-6098-10	1137491.4	657407.4	S70445	Original	0	0.5	0.609	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-10	CA-24-6098-10	1137491.4	657407.4	S70446	Field Duplicate	0	0.5	0.74		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-11	CA-24-6098-11	1137635.3	657418.0	S70447	Original	0	0.5	5.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-13	CA-24-6098-13	1137402.9	657442.7	S70449	Original	0	0.5	2.69		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-14	CA-24-6098-14	1137706.3	657477.9	S70450	Original	0	0.5	38		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-14	CA-24-6098-14	1137706.3	657477.9	S70721	Original	0.5	1	23.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-15	CA-24-6098-15	1137272.5	657489.6	S70451	Original	0	0.5	16		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-15	CA-24-6098-15	1137272.5	657489.6	S70726	Original	0.5	1	60.7		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-16	CA-24-6098-16	1137585.0	657532.1	S70452	Original	0	0.5	4.62		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-17	CA-24-6098-17	1137423.6	657572.9	S70453	Original	0	0.5	4.7		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-18	CA-24-6098-18	1137677.5	657639.4	S70454	Original	0	0.5	3.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-90	CA-24-EPA-6098-2401	1137318.7	657564.2	PB-004-02	Original	0	0.25	28		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6098-90	CA-24-6098-90	1137318.7	657564.2	S70731	Original	0.5	1	14.6		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6104-19	CA-24-6104-19	1137575.4	657821.5	S70455	Original	0	0.5	0.38		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6104-20	CA-24-6104-20	1137519.1	657849.0	S70456	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6104-21	CA-24-6104-21	1137624.1	657928.0	S70457	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6137-22	CA-24-6137-22	1137315.1	657936.1	S70458	Original	0	0.5	0.232	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6164-23	CA-24-6164-23	1137165.9	657547.0	S70459	Original	0	0.5	0.25		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6164-24	CA-24-6164-24	1137096.3	657556.9	S70460	Original	0	0.5	2.6		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6196-25	CA-24-6196-25	1136972.3	657348.2	S70461	Original	0	0.5	0.97		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6196-26	CA-24-6196-26	1136889.5	657391.7	S70462	Original	0	0.5	2.15		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6246-27	CA-24-6246-27	1136712.8	657336.8	S70463	Original	0	0.5	0.253	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6267-28	CA-24-6267-28	1136560.9	657543.1	S70464	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6267-29	CA-24-6267-29	1136642.8	657565.4	S70465	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6282-30	CA-24-6282-30	1136517.8	657320.0	S70466	Original	0	0.5	25.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6282-30	CA-24-6282-30	1136517.8	657320.0	S70736	Original	0.5	1	1.17		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6282-31	CA-24-6282-31	1136418.7	657358.3	S70467	Original	0	0.5	4.95	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6282-32	CA-24-6282-32	1136252.1	657460.9	S70468	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6321-33	CA-24-6321-33	1136090.8	657312.7	S70469	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6321-34	CA-24-6321-34	1136069.8	657442.0	S70470	Original	0	0.5	0.042	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6350-35	CA-24-6350-35	1135958.5	657420.5	S70471	Original	0	0.5	22.1		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6350-35	CA-24-6350-35	1135958.5	657420.5	S70741	Original	0.5	1	3.72		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6388-36	CA-24-6388-36	1135838.3	657498.5	S70472	Original	0	0.5	2.97		Both Datasets		Nonresidential OU-1/OU-2 FSP
24	CA-24-6388-37	CA-24-6388-37	1135761.0	657645.6	S70473	Original	0	0.5	0.039	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
24	PB-004-04	CA-24-EPA-6098-2403	1137735.0	657667.8	PB-004-04	Original	0	0.25	0.14		Both Datasets		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA25 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
25	CA-25-6127-01	CA-25-6127-01	1137358.3	657193.1	S70475	Original	0	0.5	0.062		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-02	CA-25-6156-02	1137309.2	657167.4	S70474	Original	0	0.5	0.278	.I	Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-03	CA-25-6156-03	1136307.2	656587.1	S70476	Original	0	0.5	0.04	Ü	Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-04	CA-25-6156-04	1136629.2	656630.5	S70477	Original	0	0.5	0.056		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-05	CA-25-6156-05	1136351.3	656706.6	S70478	Original	0	0.5	0.028	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-06	CA-25-6156-06	1136798.1	656821.0	S70479	Original	0	0.5	0.166		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-07	CA-25-6156-07	1136056.1	656879.6	S70480	Original	0	0.5	0.31		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-08	CA-25-6156-08	1135883.4	656978.3	S70481	Original	0	0.5	0.04	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-09	CA-25-6156-09	1136217.2	657023.5	S70482	Original	0	0.5	0.043		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-10	CA-25-6156-10	1136395.8	657089.6	S70483	Original	0	0.5	0.117	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-11	CA-25-6156-11	1137019.9	657126.5	S70484	Original	0	0.5	0.043	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-12	CA-25-6156-12	1136608.2	657169.0	S70485	Original	0	0.5	0.379		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-12	CA-25-6156-12	1136608.2	657169.0	S70486	Field Duplicate	0	0.5	0.41		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-13	CA-25-6156-13	1136090.8	657173.3	S70487	Original	0	0.5	0.223		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-14	CA-25-6156-14	1136770.0	657198.1	S70488	Original	0	0.5	0.092		Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-6156-15	CA-25-6156-15	1135960.0	657165.5	S70489	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
25	CA-25-9999-90	CA-25-9999-90	1136179.7	657226.5	S70746	Original	0.5	1	0.757	J	Original Dataset	Reclassified as sediment location	OU-1/OU-2 Nonresidential FSP
25	CA-25-EPA-43146- 2501	CA-25-EPA-43146- 2501	1136171.4	657211.3	FE2-001-A	Original	0	0.25	0.9		Original Dataset	Reclassified as sediment location	2000 EPA Nonresidential Grab Samples
25	CA-25-EPA-43146- 2502	CA-25-EPA-43146- 2502	1136179.7	657226.5	PCWASTE-004-A	Original	0	0.25	11		Original Dataset	Reclassified as sediment location	2000 EPA Nonresidential Grab Samples
25	CA-25-EPA-43166- 2503	CA-25-EPA-43166- 2503	1136222.7	657219.2	PECON-020	Original	0	0.25	0.75		Original Dataset	Reclassified as sediment location	2000 EPA Nonresidential Grab Samples
25	PB-005-02	CA-25-EPA-6156- 2500	1135972.1	657169.4	PB-005-02	Original	0	0.25	0.05	UJ	Both Datasets		USEPA Programs
25	PB-005-04	CA-25-EPA-6156- 2504	1136407.0	657177.8	PB-005-04	Original	0	0.25	1.4		Both Datasets		USEPA Programs

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

### Attachment 1 Total PCBs Data Summary - CA26 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
26	CA-26-RES-6523-C	CA-26-RES-6523-C	1135254.1	657409.9	6523-3C	Original	0	0.25	20.7		Original Dataset	IM Location/Sample	Residential
26	CA-26-RES-6523-D	CA-26-RES-6523-D	1135254.1	657409.9	6523-3D	Original	0	0.25	33.7		Original Dataset	IM Location/Sample	Residential
26	CA-26-RES-6523-E	CA-26-RES-6523-E	1135254.1	657409.9	6523-3E	Original	0	0.25	20.5		Original Dataset	IM Location/Sample	Residential
26	FC2-0083-C		1135124.4	657504.2	FC2-0083-C	Original	0	0.25	8.2		Updated Dataset		USEPA Programs
26	FC2-0083-D		1135142.5	657308.4	FC2-0083-D	Original	0	0.25	4.4		Updated Dataset		USEPA Programs
26	PB-RRB3-05	CA-26-EPA-43163-2609	1135100.6	657642.2	PB-RRB3-05	Original	0	0.25	6.5		Both Datasets		USEPA Programs
26	PCTull-001	CA-26-EPA-6629-2606	1135083.0	657445.5	PCTull-001	Original	0	0.25	0.27		Both Datasets		USEPA Programs
26	PCTull-002	CA-26-EPA-6629-2607	1135092.2	657466.1	PCTull-002	Original	0	0.25	2.1		Both Datasets		USEPA Programs
26	CA-26-6629-92	CA-26-EPA-6629-2605	1135069.2	657516.3	PCTull-003	Original	0	0.25	47		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	PCTull-004	CA-26-EPA-6629-2604	1135054.6	657549.3	PCTull-004	Original	0	0.25	3.3		Both Datasets		USEPA Programs
26	PCTull-005	CA-26-EPA-6629-2602	1134994.8	657579.1	PCTull-005	Original	0	0.25	2		Both Datasets		USEPA Programs
26	PCTull-006	CA-26-EPA-6629-2608	1135097.7	657534.5	PCTull-006	Original	0	0.25	3.9		Both Datasets		USEPA Programs
26	PCTull-007		1135140.1	657547.2	PCTull-007	Original	0	0.25	4.3		Updated Dataset		USEPA Programs
26	CA-26-9999-91	CA-26-EPA-6629-2603	1135039.7	657588.4	PCTull-008	Original	0	0.25	9.4		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-9999-93	CA-26-EPA-6629-2600	1134981.2	657657.6	PCTull-009	Original	0	0.25	5.9		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6629-90	CA-26-EPA-6629-2601	1134987.1	657606.2	PCTull-010	Original	0	0.25	6.7		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	PE-077-B		1135536.8	657128.2	PE-077-B	Original	0	0.25	2.4		Updated Dataset		Residential Sampling
26	PE-077-B		1135536.8	657128.2	PE-077-BS	Original	0	0.25	4.7		Updated Dataset		Residential Sampling
26	CA-26-6440-01	CA-26-6440-01	1135481.8	657248.7	S70368	Original	0	0.5	2.2		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6440-02	CA-26-6440-02	1135565.1	657177.4	S70369	Original	0	0.5	24.1	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6440-03	CA-26-6440-03	1135484.5	657147.4	S70370	Original	0	0.5	2.3		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6614-04	CA-26-6614-04	1135045.3	657211.4	S70371	Original	0	0.5	2.04		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6622-05	CA-26-6622-05	1135028.1	657312.6	S70372	Original	0	0.5	4		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6673-06	CA-26-6673-06	1134887.7	657252.4	S70373	Original	0	0.5	0.428		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6673-07	CA-26-6673-07	1134908.1	657156.8	S70374	Original	0	0.5	0.129		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6675-08	CA-26-6675-08	1134916.2	657543.8	S70375	Original	0	0.5	0.55		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6675-09	CA-26-6675-09	1134909.9	657345.5	S70376	Original	0	0.5	0.209		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6440-02	CA-26-6440-02	1135565.1	657177.4	S70751	Original	0.5	1	24.1		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6629-90	CA-26-6629-90	1134987.1	657606.2	S70756	Original	0.5	1	0.81		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-6629-92	CA-26-6629-92	1135069.2	657516.3	S70761	Original	0.5	1	150		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-9999-91	CA-26-9999-91	1135039.7	657588.4	S70766	Original	0.5	1	147		Both Datasets		Nonresidential OU-1/OU-2 FSP
26	CA-26-9999-93	CA-26-9999-93	1134981.2	657657.6	S70771	Original	0.5	1	18.7		Both Datasets		Nonresidential OU-1/OU-2 FSP

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used

Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

QC: quality control

# Attachment 1 Total PCBs Data Summary - CA27 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Program
27	CA-27-6730-01	CA-27-6730-01	1134591.1	657804.4	S70220	Original	0	0.5	0.148	J	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-02	CA-27-6730-02	1134454.3	657844.2	S70221	Original	0	0.5	0.036	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-03	CA-27-6730-03	1134287.4	657827.2	S70222	Original	0	0.5	2.04	J	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-03	CA-27-6730-03	1134287.4	657827.2	S70223	Field Duplicate	0	0.5	1.6	J	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-04	CA-27-6730-04	1134514.3	657822.8	S70224	Original	0	0.5	0.24		Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-05	CA-27-6730-05	1134183.2	657875.7	S70225	Original	0	0.5	0.043		Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-06	CA-27-6730-06	1134431.1	657879.5	S70226	Original	0	0.5	0.037	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-07	CA-27-6730-07	1134174.6	657924.8	S70227	Original	0	0.5	0.035	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-08	CA-27-6730-08	1134365.3	657936.5	S70228	Original	0	0.5	0.035	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-09	CA-27-6730-09	1134273.3	658010.8	S70229	Original	0	0.5	0.04	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6730-10	CA-27-6730-10	1134160.7	658147.3	S70230	Original	0	0.5	0.036	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6745-11	CA-27-6745-11	1133897.2	658744.3	S70231	Original	0	0.5	0.04	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6746-12	CA-27-6746-12	1133998.9	658558.4	S70232	Original	0	0.5	0.13		Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6748-13	CA-27-6748-13	1134128.6	658402.2	S70233	Original	0	0.5	0.039	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6748-14	CA-27-6748-14	1134387.3	658145.0	S70234	Original	0	0.5	0.082		Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6748-15	CA-27-6748-15	1134322.9	658230.1	S70235	Original	0	0.5	0.043		Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6829-16	CA-27-6829-16	1134026.7	658309.9	S70236	Original	0	0.5	0.042	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6915-17	CA-27-6915-17	1133726.1	658092.0	S70237	Original	0	0.5	0.038	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6915-18	CA-27-6915-18	1133665.9	658225.0	S70238	Original	0	0.5	0.04	U	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6915-19	CA-27-6915-19	1133703.1	658278.0	S70239	Original	0	0.5	0.101	J	Both Datasets	Nonresidential OU-1/OU-2 FSP
27	CA-27-6915-20	CA-27-6915-20	1133524.1	658292.1	S70240	Original	0	0.5	1.27		Both Datasets	Nonresidential OU-1/OU-2 FSP

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit FSP: field sampling plan OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA29 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
29	CA-29-7301-01	CA-29-7301-01	1132529.5	656487.3	S70241	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-02	CA-29-7301-02	1131826.4	656516.6	S70242	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-03	CA-29-7301-03	1131252.9	656484.4	S70243	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-04	CA-29-7301-04	1132176.0	656551.9	S70244	Original	0	0.5	0.048		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-05	CA-29-7301-05	1132005.0	656580.3	S70245	Original	0	0.5	0.1		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-06	CA-29-7301-06	1131067.0	656596.1	S70246	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-07	CA-29-7301-07	1132386.4	656616.9	S70247	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-08	CA-29-7301-08	1131162.1	656607.1	S70248	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-09	CA-29-7301-09	1131529.4	656657.0	S70249	Original	0	0.5	0.102		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-10	CA-29-7301-10	1131899.1	656769.0	S70250	Original	0	0.5	0.171	J	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-10	CA-29-7301-10	1131899.1	656769.0	S70251	Field Duplicate	0	0.5	0.312		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-11	CA-29-7301-11	1130904.4	656834.8	S70252	Original	0	0.5	0.04	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-12	CA-29-7301-12	1131392.4	656954.9	S70253	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-13	CA-29-7301-13	1132498.9	656876.9	S70254	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-14	CA-29-7301-14	1132316.0	656932.9	S70255	Original	0	0.5	0.06		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-15	CA-29-7301-15	1131113.0	657050.2	S70256	Original	0	0.5	0.834		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7301-16	CA-29-7301-16	1131288.9	657213.1	S70257	Original	0	0.5	0.351		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7536-17	CA-29-7536-17	1131945.0	656965.7	S70258	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7536-18	CA-29-7536-18	1131400.9	657072.4	S70259	Original	0	0.5	0.044		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7536-19	CA-29-7536-19	1131847.8	657094.0	S70260	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7536-20	CA-29-7536-20	1131876.1	657223.0	S70261	Original	0	0.5	0.067		Both Datasets		Nonresidential OU-1/OU-2 FSP
29	CA-29-7536-21	CA-29-7536-21	1131691.1	657288.0	S70262	Original	0	0.5	0.088		Both Datasets		Nonresidential OU-1/OU-2 FSP

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

### Attachment 1 Total PCBs Data Summary - CA30 Anniston PCB Site, Anniston, Alabama

EU	Updated Location	Original Location	Northing	Easting	Field Sample ID	QC Type	Depth Top	Depth Bottom	Result Value	Qualifier	Dataset Comparison	Notes	Program
30	CA-30-7494-01	CA-30-7494-01	1132038.0	660624.1	S70490	Original	0	0.5	0.037	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7494-02	CA-30-7494-02	1132010.3	660642.6	S70491	Original	0	0.5	0.051	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7494-03	CA-30-7494-03	1132109.0	660699.0	S70492	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7494-04	CA-30-7494-04	1132014.0	660715.0	S70493	Original	0	0.5	0.038	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7494-05	CA-30-7494-05	1132085.1	660733.1	S70494	Original	0	0.5	0.034	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7494-06	CA-30-7494-06	1132132.2	660761.1	S70495	Original	0	0.5	0.04	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7824-07	CA-30-7824-07	1131065.0	659227.0	S70496	Original	0	0.5	0.036	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7824-08	CA-30-7824-08	1131189.8	659235.5	S70497	Original	0	0.5	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7824-09	CA-30-7824-09	1131159.9	659254.0	S70498	Original	0	0.5	0.039		Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-7824-10	CA-30-7824-10	1131124.9	659271.9	S70499	Original	0	0.5	0.035	U	Both Datasets		Nonresidential OU-1/OU-2 FSP
30	CA-30-RES-7360-A	CA-30-RES-7360-A	1132521.1	660745.7	7360-3A	Original	0	0.25	0.39		Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7360-B	CA-30-RES-7360-B	1132521.1	660745.7	7360-3B	Original	0	0.25	0.35		Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7396-A	CA-30-RES-7396-A	1132388.6	660577.3	7396-3A	Original	0	0.25	0.08	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7396-B	CA-30-RES-7396-B	1132388.6	660577.3	7396-3B	Original	0	0.25	0.085	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7396-D	CA-30-RES-7396-D	1132388.6	660577.3	7396-3D	Original	0	0.25	0.084	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7408-A	CA-30-RES-7408-A	1132340.1	660381.6	7408-3A	Original	0	0.25	0.087	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7408-B	CA-30-RES-7408-B	1132340.1	660381.6	7408-3B	Original	0	0.25	0.087	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7408-C	CA-30-RES-7408-C	1132340.1	660381.6	7408-3C	Original	0	0.25	0.084	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7431-A	CA-30-RES-7431-A	1132270.0	660220.3	7431-3A	Original	0	0.25	0.079	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7431-B	CA-30-RES-7431-B	1132270.0	660220.3	7431-3B	Original	0	0.25	0.048		Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7431-C	CA-30-RES-7431-C	1132270.0	660220.3	7431-3C	Original	0	0.25	0.067		Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7475-A	CA-30-RES-7475-A	1132165.2	660039.3	7475-3A	Original	0	0.25	0.08	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7475-B	CA-30-RES-7475-B	1132165.2	660039.3	7475-3B	Original	0	0.25	0.039		Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7481-A	CA-30-RES-7481-A	1132089.5	659886.4	7481-3A	Original	0	0.25	0.077	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7481-B	CA-30-RES-7481-B	1132089.5	659886.4	7481-3B	Original	0	0.25	0.082	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7493-A	CA-30-RES-7493-A	1132117.1	660037.1	7493-3A	Original	0	0.25	0.081	U	Original Dataset	Residential location/sample	Residential
30	CA-30-RES-7493-B	CA-30-RES-7493-B	1132117.1	660037.1	7493-3B	Original	0	0.25	0.323		Original Dataset	Residential location/sample	Residential

Data were new additions to dataset.

Discrepancy between HHRA analysis/results and updated database output for data that should be used Data were originally in dataset; but since removed for various reasons (see notes on each table).

All depths presented in feet

All results presented in milligrams per kilogram (mg/kg)

J: indicates an estimated value

U: indicates value is below laboratory detection limits

EU: exposure unit

FSP: field sampling plan

OU: operable unit

# Appendix G

**Constituents of Potential Concern other than PCBs** 

1

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G.1 Constituents of Potential Concern other than Polychlorinated Biphenyls

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Total PCB Aroclor Concentrations in Snow Creek Sediment with Distance from
Lake Logan Martin
Total PCB Aroclor Concentrations in Soil
Total PAH Concentrations in Soil and Sediment
Total PCDD/DF TEQ Concentrations in Soil and Sediment
Total PCDD/DF Concentrations in Choccolocco Creek Sediment with Distance
from Lake Logan Martin
PCDD/DF Concentrations as a Function of Total PCB Concentrations
PCDD/DF TEQ Concentrations as a Function of Total PCB Concentrations
Frequency Distribution of Arsenic in Soil
Arsenic Concentrations in Soil and Sediment
Arsenic Concentrations in Snow Creek Sediment with Distance from Lake Logan Martin
Frequency Distribution of Barium in Soil
Frequency Distribution of Cadmium in Soil
Cadmium Concentrations in Snow Creek Sediment with Distance from Lake Logan Martin
Frequency Distribution of Chromium in Soil
Concentrations of Chromium in Soil
Chromium Concentrations in Snow Creek Sediment with Distance from Lake
Logan Martin
Frequency Distribution of Cobalt in Soil
Cobalt Concentrations in Snow Creek Sediment with Distance from Lake Logan
Martin
Copper Concentrations in Snow Creek Sediment with Distance from Lake Logan Martin
Frequency Distribution of Lead in Soil
Lead Concentrations in Snow Creek Sediment with Distance from Lake Logan
Martin
Frequency Distribution of Manganese in Soil
Frequency Distribution of Mercury in Soil
Mercury Concentrations in Soil
Nickel Concentrations in Snow Creek Sediment with Distance from Lake Logan Martin
Frequency Distribution of Vanadium in Soil

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# **Acronyms and Abbreviations**

%: percent

ADEM: Alabama Department of Environmental Management

ASM: adaptive site management

COPC: constituents of potential concern

CSM: conceptual site model

DDT: dichlorodiphenyltrichloroethane

DL-PCB: dioxin-like polychlorinated biphenyl

FS: feasibility study

FSP: field sampling plan

HHRA: human health risk assessment

IROD: Interim Record of Decision

μg/kg: microgram(s) per kilogram

mg/kg: milligram(s) per kilogram

NRC: National Research Council

OP: organo-phosphorous (pesticide)

OU: operable unit

P/S: Pharmacia LLC and Solutia Inc.
PAH: polycyclic aromatic hydrocarbon

PCB: polychlorinated biphenyl

PCD: Partial Consent Decree

PCDD/DFs: polychlorinated dibenzo-p-dioxins and dibenzofurans

PSCSR: preliminary site characterization summary report

RAO: remedial action objective

RI/FS: remedial investigation/feasibility study

RSL: regional screening level

SAIC: Science Applications International Corporation

SERA: streamlined ecological risk assessment

SVOC: semivolatile organic compound

TAL: target analyte list

TCL: target compound list

TEQ: toxic equivalent (2,3,7,8-TCDD equivalent)

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USEPA: United States Environmental Protection Agency

VOC: volatile organic compound

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# **G.1 Constituents of Potential Concern other than Polychlorinated Biphenyls**

On August 4, 2003, the United States District Court for the Northern District of Alabama entered a revised Partial Consent Decree (PCD; USEPA 2003a) requiring, among other things, Pharmacia LLC and Solutia Inc. (together Pharmacia LLC and Solutia Inc. are referred to as P/S) to conduct a remedial investigation and feasibility study (RI/FS) for the Anniston Polychlorinated Biphenyls (PCB) Site. The Site encompasses the Solutia Inc. Anniston Plant (Facility) (formerly owned and operated by Monsanto Company, now known as Pharmacia LLC), other properties currently owned by Solutia Inc., certain residential and nonresidential properties owned by third parties, and portions of both Choccolocco Creek and Snow Creek and their floodplains. The Anniston PCB Site is not on the Superfund National Priorities List but is being addressed through the Superfund Alternative Approach.

This constituent of potential concern (COPC) evaluation focuses on constituents other than PCBs as COPCs for operable unit (OU)-1/OU-2. This evaluation builds on the initial evaluation of COPCs included with the *OU-1/OU-2 Preliminary Site Characterization Summary Report* (OU-1/OU-2 PSCSR; ARCADIS BBL 2007a) and includes more recent COPC information for the Facility (OU-3) portion of the Site. An Interim Record of Decision (IROD) has been issued for OU-3, and the OU-3 findings provide context for the evaluation of COPCs in in OU-1/OU-2. This evaluation also adds information updated since the OU-1/OU-2 PSCSR on various sources of background data and uses more recent screening levels. COPCs were evaluated using the adaptive site management (ASM) process for OU-1/OU-2 as defined in the *Phase 1 Field Sampling Plan for Operable Unit 4* (OU-4 Phase 1 FSP; BBL 2006a).

The goal of this COPC evaluation is to assist in defining the constituents that will be carried forward into the OU-1/OU-2 feasibility study (FS). Consistent with the United States Environmental Protection Agency- (USEPA-) approved *Remedial Investigation/Feasibility Study Work Plan* (RI/FS Work Plan; BBL 2000), the RI/FS process for each OU includes developing remedial action objectives (RAOs) that address Site-related constituents. While samples were analyzed during investigations for constituents that may not be Site-related and carried through the risk assessment process in the RI, it is anticipated that non-Site-related constituents will not be part of the FS process in terms of RAOs and remedial alternatives.

The COPC evaluation is based on a wider list of constituents that the USEPA requested be evaluated based on 10 percent (%) of the samples analyzed for Aroclors. While the evaluation is comprehensive in this regard, specific focus is placed on constituents that USEPA identified for evaluation in the human health risk assessment (HHRA; CDM 2010) and a separate list of constituents that USEPA requested be evaluated in the OU-1/OU-2 streamlined ecological risk assessment (SERA; ARCADIS 2013). In addition to PCBs, the HHRA evaluated risks associated with arsenic, chromium, lead, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/DFs) as toxic equivalents (TEQs) to 2,3,7,8–tetrachlorodibenzo-p-dioxin. In a similar manner, PCDDs/DFs, and metals—including barium, chromium, cobalt, lead, manganese, mercury, nickel, and vanadium—were evaluated in the OU-1/OU-2 SERA.

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Section G.1.1 summarizes previous COPC studies conducted for the Site. Section G.1.2 provides an overview of the COPC evaluation process and includes subsections that discuss the ASM process, the specific process used for the Site, the types and sources of data, the screening levels used for each OU and matrix, and the data used to evaluate background conditions. Section G.1.4. includes a brief summary of the OU-3 IROD findings as they pertain to the possibility that OU-3 is a potential source for COPCs to OU-1/OU-2. Section G.1.6 includes an evaluation of whether constituents should be considered as Site-related COPCs for the RI/FS evaluation. Section G.1.7 includes a summary of the COPC evaluation findings.

Tables and figures are referenced throughout this evaluation to present the available data and information regarding the potential applicability of the constituent as being Site-related or not. Each table lists the constituent and matrix-specific screening level, the number of samples analyzed for that constituent (by OU and matrix), the frequency of detection, the average and maximum concentrations detected, and the number of samples with concentrations detected above screening levels. Section G.1.4 discusses sources of background data, including data from nearby Fort McClellan and from upstream and outside of the influence of Snow Creek. Where available, background average concentrations and twice the background average concentrations are also included on the tables, along with the number of samples with constituents detected above twice mean background concentrations. The notes column of each table summarizes recommendations regarding the applicability of the COPC in terms of being Site-related.

Figures are also referenced to support the evaluation of COPCs. Figure G-1 summarizes the site-specific ASM process described in the planning documents (e.g., the OU-4 Phase 1 FSP; [BBL 2006a] and the *Baseline Problem Formulation for Operable Unit 4 of the Anniston PCB Site* [ARCADIS BBL 2006b]). Figures G-2 through G-4 show the distribution of concentrations of PCBs in soil and sediment. These PCB figures provide a basis for whether other constituents are distributed similarly to PCBs or appear to have a different pattern. The remaining figures illustrate the concentrations and distribution of constituents within and outside of OU-1/OU-2. The data presented in these figures for locations outside of the OU-1/OU-2 nonresidential investigation footprint are included in electronic form in Appendix C to the OU-1/OU-2 RI. These figures are organized by constituent (PAHs [Figure G-5], PCDD/DFs [Figures G-6 through G-9], and metals [Figures G-10 through G-28]). Metals are organized in alphabetical order by metal and include, where needed for explanation, frequency distributions in soil, followed by sediment concentrations.

# **G.1.1** Overview of Previous COPC Investigations

For over 20 years, investigations have been carried out to assess the nature and extent of environmental impacts in, around, and downstream of the Facility. Initially, work was focused on sampling and analysis tasks to evaluate the presence of a list of constituents associated with historical operations and waste management practices at the Facility. This list of constituents—referred to as the potential constituents of concern and included as Exhibit F to the PCD (USEPA 2003a)—was evaluated in a series of reports approved by the USEPA and Alabama Department of Environmental Management (ADEM) between 1998 and 2004. That list included PCBs, 16 other organic compounds (including 4 volatile organic compounds [VOCs], organo-

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phosphorous [OP] pesticides, dichlorobenzenes, and phenols), and 11 metals (referred to as the PCD list of metals).

In 2005, the USEPA clarified a request that investigations include limited analyses (10% of the samples) for a "wider list of constituents" (USEPA 2005a), which included target compound list (TCL) VOCs, semivolatile organic compounds (SVOCs), PAHs, PCDD/DFs, and target analyte list (TAL) inorganics, in addition to the shorter list of chemicals included in the PCD. Select samples of soil, sediment, and surface water collected as part of subsequent field efforts were analyzed for this wider list of constituents and encompassed the list of constituents included in the PCD.

The overall approach for assessing the applicability of the COPCs being Site-related has been presented, discussed, and updated with available data in several project documents, most recently in the following:

- OU-1/OU-2 PSCSR (ARCADIS BBL 2007b)
- Site-Wide Quality Assurance Project Plan (ARCADIS 2008)
- OU-4 Phase 2 FSP (ARCADIS 2010a)

In addition, the USEPA recently finalized an IROD for OU-3 (OU-3 IROD; USEPA 2011a) that identified constituents of concern for OU-3. A summary of the OU-3 IROD findings as they relate to constituents of concern is included in Section G.1.4. This COPC evaluation builds on these previous evaluations, coordinates the findings, where appropriate, and incorporates the most recent and available data. This document includes additional sources of background data and the most recently available screening levels, as described in more detail in Section G.1.4.

# **G.1.2 Technical Approach**

The COPC evaluation process included several steps in an iterative and weight-of-evidence approach to assess whether the constituents are Site-related COPCs. The evaluation generally followed the site-specific ASM process summarized on Figure G-1. However, the evaluation process was refined following the collection of significant quantities of data. The COPC evaluation presented herein includes a comparison of constituent concentrations with screening levels, with background data from several sources, and with the distribution pattern of PCBs (identified as a COPC originating from the Facility). The data were evaluated using these multiple lines of evidence to assess whether the constituents are of concern and whether the presence and concentrations of the constituents appear to be associated with the Site. The evaluation process is described in additional detail in the following subsections.

# **G.1.2.1** Adaptive Site Management Process

Incorporating an ASM process into investigations and risk assessments is a scientifically valid approach that the USEPA often uses in planning and managing environmental issues in watersheds (USEPA 2004) and governmental agencies employ for federal site restoration, as outlined by the National Research Council (NRC) in *Environmental Cleanup at Navy Facilities:* Adaptive Site Management (NRC 2003). The NRC has also recommended using ASM for sites with PCB-contaminated sediment (NRC 2001). USEPA contaminated sediment remediation

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guidance (USEPA 2005b) supports the ASM approach, and the ecological risk assessment guidance (USEPA 1997, 1998) identifies an iterative approach as a potentially valuable tool in ecological risk assessment.

# G.1.2.2 Site-Specific COPC Evaluation

COPCs were evaluated using the ASM approach outlined on the flow chart shown on Figure G-1. These steps were the basis for the preliminary COPC discussions presented in the OU-1/OU-2 PSCSR, the OU-4 Phase 1 FSP (BBL 2006a), and the OU-4 Phase 2 FSP (ARCADIS 2010a). These steps were essentially repeated for this most recent evaluation, with the larger data set now available for OU-1/OU-2. This evaluation also incorporates COPC findings for OU-3, as stated in the OU-3 IROD.

Based on previous investigations and the large amount of data available, the primary media of interest for OU-1/OU-2 are soil and sediment. Although other media (air, surface water, and/or biota) may be affected by COPCs, they are not discussed herein because the presence and concentration of constituents in these other OU-1/OU-2 media will generally be a function of their concentrations in OU-1/OU-2 soil and sediment. The focus of this COPC evaluation is to identify those constituents present in soil or sediment that may be of concern in OU-1/OU-2. This evaluation also considers whether these constituents might originate from OU-3. The steps used for the COPC evaluation presented herein are outlined as follow:

- 1. Type of Constituent. Constituent data were evaluated for the two matrices (soil and sediment) separately. For example, metals data for soil in OU-1/OU-2 were evaluated separately from metals data for sediment. Analytes were evaluated individually or by chemical class. For example, most VOCs, SVOCs, and metals results appear to be unrelated to each other, and individual analytes were considered separately. PAH and PCDD/DF compounds were evaluated as classes of chemicals, as these tend to be detected in related groups. To a lesser extent (as a function of less frequent detection), other classes of chemicals also warrant consideration as a group of chemicals (e.g., phenols, OP pesticides) based on their known use at the Facility. Metals were evaluated individually, as each has a unique, naturally occurring background component as well as known anthropogenic sources in the area.
- 2. Comparison to Screening Levels. Where a constituent was not detected, it was no longer considered a possible COPC. Detected concentrations for individual constituents were compared with relevant, matrix-specific screening levels and are discussed in more detail in Section G.1.3. If the constituent was not reported above the screening level, the constituent is not considered a COPC.
- 3. Frequency of Detections above Screening Levels. The frequency and magnitude of detected concentrations above screening levels were reviewed to assess whether these appear to be Site-wide or isolated occurrences. If the constituent was reported above the screening level with significant frequency (more than 10% of the time) it was further evaluated. Occasional occurrences above the screening levels are not likely to drive conclusions or subsequent decisions.

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- 4. Comparison with Background. Analytical data for constituents detected above screening levels with some frequency were further evaluated to assess whether they are associated with naturally occurring or anthropogenic background. Concentrations of constituents within the footprint of the OU were assessed relative to background concentrations (i.e., concentrations outside of the footprint of the OU). Background data provide an indication of natural occurrence, especially for certain metals, and also provide a measure of the concentrations of anthropogenic background from the multiple industries and commercial operations, such as PAHs, PCDD/DFs, and metals. Sources for background data are described in more detail in Section G.1.3 below.
- 5. Possible Source(s). The frequency and magnitude of detected concentrations above screening levels were reviewed to assess whether a distribution pattern was apparent. Low frequency occurrences of elevated concentrations away from the Facility were considered to be associated with sources other than the Facility. In some cases, concentrations were detected above screening levels, but no significant elevated source area or distribution was identified, suggesting that the presence of the constituent might be a function of naturally occurring or anthropogenic background conditions, rather than a release.
- 6. Site Related. The pattern of distribution (higher to lower concentration) was evaluated relative to concentrations and distribution of PCBs which, for the purposes of this analysis only, are assumed to be Facility related. The evaluation considered the distribution of constituents inside the 100-year floodplain versus those outside of the 100-year floodplain. This is based on the conceptual site model (CSM) for the Site where the primary release mechanism and transport pathways for Site-related constituents was surface water runoff from the Facility (OU-3) to the 11th Street Ditch and the subsequent downstream flow in Snow Creek. From there, PCBs could move into the 100-year floodplain during overbank flooding or be transported further downstream. The lateral extent of PCB-containing material from OU-3 via this release mechanism is the 100-year floodplain as demonstrated by the distribution of PCBs in the floodplain soils of OU-4. These data are presented in the Phase I Conceptual Site Model Report for the Anniston PCB Site (BBL 2003) and the Phase 3 Field Sampling Plan for Operable Unit 4 of the Anniston PCB Site (ARCADIS 2010b) and support the outer edge of the 100-year floodplain as the limit of lateral PCB migration due to overbank flooding. Using this knowledge informs the evaluation to the sources and/or release mechanisms for constituents located outside of the 100-year floodplain. The CSM recognizes other source release mechanisms and transport pathways but acknowledges the important role of the surface water runoff from the Facility in the distribution of PCBs in the 100-year floodplain. The presence of other sources and release mechanisms within OU-1/OU-2 can contribute to a variable PCB distribution; yet, based on the hydraulic characteristics of OU-1/OU-2 and OU-4, the distributions of PCBs in OU-4, the 100-year floodplain of Snow Creek is viewed as the footprint where constituents from OU-3 would have been transported via surface water runoff.

In several instances, the outcomes from these steps were combined in an interrelated, weight-of-evidence approach to determine that the presence of constituents is due to multiple possible naturally occurring or anthropogenic sources of background. In a few cases, elevated concentrations may be from a source other than the Facility.

# G.1.3 Types and Sources of Data

Site and OU investigations are detailed in the investigations implemented for OU-1/OU-2 and the associated data are presented in Section 4 of the RI report. This COPC evaluation summarizes the available data by constituent and presents screening levels, available background data, number of samples, and mean and maximum detected concentrations in the tables as referenced below. Where appropriate, the following sections also discuss figures that illustrate the distribution of concentrations of the various constituents.

# **G.1.3.1 Soil Screening Levels**

Screening levels used for this assessment are presented in Tables G-1 through G-12 for soil and sediment and are described below.

For OU-1/OU-2 soil, human health screening levels from the following sources were used:

- USEPA Regional Screening Level (RSL) Summary Table for human health (USEPA 2011b)
- In a few cases (e.g., substituted furans), RSLs for human health were published in 2008 (USEPA 2008) and were not included on the 2011 Tables. The 2008 levels were used for screening purposes, where applicable.

# **G.1.3.2 Sediment Screening Levels**

Sediment screening values, where available, were used from Table 3: "USEPA Region 4 Waste Management Division Sediment Screening Values for Hazardous Waste Sites" of *Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment* (USEPA 2001). For constituents with no USEPA Region 4 screening value, the sediment screening levels from the sources listed below were used:

- USEPA Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Values (USEPA 2003b)
- USEPA Region 3 Freshwater Sediment Screening Benchmarks (USEPA 2006)

### G.1.4 Background Data

Where appropriate, available background data were used for comparison to assess whether constituents appeared to be present as a result of naturally occurring or anthropogenic background. Background data are available from investigations conducted by P/S and the USEPA. Background PAH and metals data are available from studies conducted at nearby Fort McClellan.

USEPA's definition of "background" includes constituents or locations not influenced by the releases from a site and is usually described as naturally occurring or anthropogenic. "Anthropogenic" is defined as natural and human-made substances present in the environment as a result of human activities (not specifically related to the release in question) (USEPA 1989, 1995).

Metals are naturally occurring in soils and sediments. In several instances, the screening levels for metals are too low to provide a basis for distinguishing naturally occurring or local, urban background from a potential source area. Therefore, the evaluation of metals results included an initial comparison with published background data for nearby Fort McClellan (Science Applications International Corporation [SAIC] 1998). The data from the Fort McClellan study were considered to be representative of naturally occurring background concentrations. In the Anniston area, several historical and current industries are known to have used metals as a part of their processes, and the concentrations of some heavy metals are higher in the Anniston area than in Fort McClellan background samples. These industries may also be a source for some persistent organic chemicals, in particular PAHs and PCDD/DFs. Where available, data from outside or upstream of OU-1/OU-2 are used as a measure of anthropogenic and local background. In accordance with the ASM process, analytical results were evaluated in several ways to assess whether their presence and concentration were associated with naturally occurring or anthropogenic background; whether their presence is of concern in soil, sediment, or both; and whether their presence is Facility related. Consistent with risk assessment guidance (USEPA 2000), constituent concentrations less than twice the mean background concentrations were considered as naturally occurring or anthropogenic background.

The following data were used as source of background data for the COPC evaluation:

- PAH and metals data from studies conducted at nearby Fort McClellan. Metals data for soil and sediment samples from Fort McClellan were taken from the Background Metals Survey Report (SAIC 1998). PAH data for soils collected from next to asphalt pavement were used from Table 4-2 of the Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama (IT Corporation [IT] 2000). This report did not calculate total PAHs. For comparison purposes, the total twice the mean Fort McClellan PAH background value presented in Tables G-7 and G-8 was calculated as the sum of the means presented in Table 4-2 of the IT report (IT 2000). In the absence of a local source of background data for sediment, Fort McClellan PAH background soil data were used as representative of urban background values for both soil and sediment.
- Floodplain soil background concentrations. Samples collected by the USEPA and P/S from locations outside of the current OU-1/OU-2 nonresidential study footprint were used as floodplain soil background.
- OU-1/OU-2 sediment background concentrations. Data collected from locations that are
  upstream of the 11th Street Ditch from a hydraulic perspective are used as background
  sediment data. These include samples collected from 14th Street, 16th Street, and the
  West 9th Street Creek. These upstream, background sediment samples were collected
  from locations upstream of the hydraulic influence of the Facility and include data for PCBs
  and several metals.

# G.1.5 OU-3 COPC Findings

The IROD for OU-3 (USEPA 2011a) identifies 20 constituents of concern for OU-3. Of these 20 constituents, only PCBs and 2,3,7,8-tetrachlorodibenzo-p-dioxin TEQ (inclusive of dioxin-like PCB [DL-PCB] congeners) were identified as of concern in both soil and groundwater. PCBs

were identified as COPCs in air in OU-3. Although other constituents were identified as of concern in OU-3, their presence and migration pathways were via soils and groundwater and concentrations in air were not of concern. PCB concentrations in air for OU-3 were within the USEPA acceptable risk range and were not identified as a risk driver for the remedial activities specified in the IROD for OU-3.

The OU-3 IROD identifies 13 constituents of concern in groundwater that are not identified for soils. These are primarily constituents with higher water solubility and less environmental persistence than PCBs and are known to have been used at the Facility. These include chlorinated VOCs, phenols, and OP pesticides. The OU-3 IROD states that migration of constituents via groundwater is limited for several reasons, including natural processes and continuing corrective actions. Monitoring will be a component of the OU-3 remedy.

The following table lists constituents and maximum concentrations that were identified as constituents of concern in soil and not in groundwater in OU-3.

**Constituent of Concern** 2x Mean OU-1/OU-2 **Maximum Concentration** in Soil Background (mg/kg) in OU-3 Soil (mg/kg) 66 1.9 benzo(a)pyrene benzo(b)fluoranthene 48 2.4 dibenz(a,h)anthracene 2.1 0.62 heptachlor epoxide Not available 0.38

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**OU-3 Constituents of Concern in Soil Only** 

mg/kg: milligrams per kilogram

arsenic

Concentrations are compared with twice the mean OU-1/OU-2 background concentrations as a measure of local urban background. PAHs are ubiquitous in urban environments, and their presence in OU-3 soils could be from any number of potential sources including asphalt pavement and the storage and use of organic fuels within the Site. Although PAHs were identified as constituents of concern in OU-3 soils, the concentrations are generally low and much lower than concentrations in and outside of OU-1/OU-2. OU-1/OU-2 PAH in soil data are consistent with the presence of other possible sources in the Anniston area. The concentrations of PAHs in OU-3 do not appear to represent a point source release of PAHs to soil, nor do these concentration levels pose a significant threat of potential migration to other OUs via surface or groundwater. Similarly, the concentration of heptachlor epoxide may be from the use of this or other pesticides at the Facility, but the concentration does not represent a significant point source or potential for migration from OU-3 soil to other media or OUs.

The concentrations of arsenic in OU-3 soils are higher than in OU-1/OU-2 background. The OU-3 mean concentration of 25.4 milligrams per kilogram (mg/kg) is only slightly higher than twice the mean OU-1/OU-2 background (16.8 mg/kg). The OU-3 maximum of 390 mg/kg is higher than the OU-1/OU-2 background maximum of 120 mg/kg. Although the data for arsenic indicate possible isolated areas of elevated concentrations in OU-3, the elevated concentrations

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are not widespread and are not of a magnitude that would suggest a point source release or indicate that the Facility would be the source of arsenic to other OUs. Arsenic concentrations in the Anniston area appear to be from multiple possible native and anthropogenic sources based on the data for OU-1/OU-2.

The OU-3 IROD also identifies PCBs and dioxin TEQ (inclusive of PCDD/DFs and DL-PCB congeners) as constituents of concern for both soil and groundwater. According to the OU-3 IROD, preliminary data suggest that the PCB remedial goals will be protective for dioxin TEQ, and the IROD requires sampling during the remedial design phase to verify that the PCB remedial goals are protective for dioxins when the dioxin TEQ includes PCDD/DFs and DL-PCBs.

#### G.1.6 COPC Evaluation

This section evaluates the available chemical data in accordance with the process described in Section G.1.2. Results from OU-3 are discussed in Section G 1.5, as OU-3 is a potential source area for Site-related constituents to Snow Creek (OU-1/OU-2). Where appropriate, results for OU-1/OU-2 are evaluated relative to OU-3 and other potential sources, including native and anthropogenic background sources. Data for soil and sediment are evaluated using the screening levels discussed in Section G.1.3.

The Site OUs have been characterized for the nature and extent of PCBs in the various media of interest. PCBs are the primary COPC for the Site OUs, and are present in soil, groundwater, sediment, surface water, and biota. Because PCBs are the primary COPC for the Site OUs, their frequency of detection, concentrations, and distribution patterns are useful in understanding the fate and transport of other constituents potentially originating from the Facility. These fate and transport mechanisms are evaluated in detail in the CSM (BBL 2003). Data collected since the initial development of the CSM continue to support the fundamental premises of the CSM and demonstrate that PCB concentrations decrease with distance downstream of the Facility and with distance out into the floodplain on either side of the creek.

PCB distributions throughout the investigation areas in soil and sediment are presented in different formats in Figures G-2 through G-4. The frequency of PCB concentrations in OU-1/OU-2 background and inside the investigation footprint of OU-1/OU-2 are shown on Figure G-2. PCB concentrations in OU-1/OU-2 sediment are shown on Figure G-3. PCB concentrations in soil are summarized in plan view on Figure G-4. These distribution patterns are referenced in the discussion of other constituents, where appropriate, to evaluate whether the distribution of other constituents is similar or related to the distribution of PCBs.

It is important to recognize that the OU-1/OU-2 investigation area footprint extends well beyond the 100-year floodplain in certain locations. This is significant for floodplain soils in that the 100-year floodplain is the maximum lateral extent to which constituents would be transported from the Facility via the surface water pathway, which is the primary pathway from the Facility to soils and sediment. Portions of Snow Creek located in the upper portion of the OU-1/OU-2 investigation area footprint (roughly upstream of the Snow Creek and 11th Street Ditch confluence) are upstream of the hydraulic influence of the Facility. Constituents present in the

upstream Snow Creek locations are representative of the upstream watershed and not the Facility, as the flood waters do not migrate significantly in an upstream direction.

OU-1/OU-2 data are summarized in Tables G-1 through G-12. The tables summarize the constituents detected relative to screening values and the available background data (Section G.1.4). Note that the number of samples for individual constituents within a given chemical group (e.g., VOC, SVOC) may vary because the analyte lists were slightly different over the different sampling programs. The results are discussed in the following subsections, organized by constituent class.

## G.1.6.1 VOCs

**In Soil:** Floodplain soil data for OU-1/OU-2 VOCs are summarized in Table G-1. VOCs are not COPCs in OU-1/OU-2 soils. In approximately 60 soil samples, ethylbenzene was the only VOC compound detected above the screening level and in only one sample.

**In Sediment:** VOCs in OU-1/OU-2 sediments are summarized in Table G-2. Only a few VOCs (four) were detected in OU-1/OU-2 sediment. Only benzene was detected above the screening level and in only one sample. VOCs are not COPCs for OU-1/OU-2.

## G.1.6.2 Pesticides

**In Soil:** OU-1/OU-2 pesticides in soil data are summarized in Table G-3. Chlorinated and OP pesticides are not COPCs for OU-1/OU-2. Pesticides were detected in soils infrequently and exceeded screening levels even less frequently. The pesticide detected above screening levels most frequently was dieldrin (7 out of 117 [6%] of the samples). Of the other pesticides, only 4',4'- dichlorodiphenyltrichloroethane (4,4'-DDT), aldrin, and heptachlor were detected above screening levels in only one sample each. Furthermore, false positive identification is a possibility and the quantification of pesticides is always uncertain and possibly biased high when detected in the presence of PCBs. Multiple possible industrial, agricultural, and residential sources of pesticides are present in and around the Anniston area. OP pesticides listed in the PCD as possible COPCs were not detected in OU-1/OU-2.

**In Sediment:** Pesticides in OU-1/OU-2 sediments are summarized in Table G-4. Region 4 sediment screening levels are the same as the analytical reporting limit, so that when pesticides were detected, they were usually above the screening levels. The concentrations reported are relatively low; the highest being 0.11 mg/kg (4,4'-DDT) and the second highest being dieldrin at 0.07 mg/kg. Aldrin, alpha and gamma-chlordane, beta-BHC, endosulfan II, and heptachlor epoxide were also reported above screening levels in one to four samples. These concentrations are representative of common industrial and agricultural routine use of pesticides. The concentration and distribution of pesticides do not indicate a point source or release from the Facility or outside of OU-1/OU-2. OP pesticides listed as potential COPCs in the PCD were not detected in OU-1/OU-2 sediments.

#### G.1.6.3 SVOCs other than PAHs

**In Soil:** OU-1/OU-2 SVOCs (other than PAHs) in soil data are summarized in Table G-5. SVOCs are not COPCs for OU-1/OU-2. Only four SVOC compounds, bis(2-ethylhexyl)

phthalate, carbazole, dibenzofuran, and pentachlorophenol, were reported at concentrations above screening levels and were reported above screening levels in only 2 or 3 of 121 (less than 3%) of samples. SVOCs are not COPCs for OU-1/OU-2.

**In Sediment:** SVOCs other than PAHs in OU-1/OU-2 sediments are summarized in Table G-6. Few sediment SVOCs were detected, and no SVOCs were reported at concentrations above screening levels. SVOCs are not COPCs for OU-1/OU-2.

#### G.1.6.4 PAHs

**In Soil:** PAH concentrations in soil for OU-1/OU-2 are summarized in Table G-7 and shown on Figure G-5. PAH concentrations in soil appear to be attributable to local conditions in the area. OU-1/OU-2 background and OU-1/OU-2 PAH concentrations are significantly higher than OU-3 PAH concentrations and concentrations inside the OU are higher than background, indicating sources of PAHs to OU-1/OU-2 other than OU-3. This is consistent with the urban and industrial activities in the general Anniston area.

Figure G-5 shows the locations of the elevated PAH concentrations to the north and west of the Facility and outside of the influence of OU-3. The presence of elevated concentrations of PAHs in soils is consistent with current and historical industries in the area known to burn fossil fuels as a part of operations. As shown on Figure G-5, the elevated concentrations of PAHs within the OU-1/OU-2 investigation area footprint are tied to the industrial area to the north of OU-3 and the 100-year floodplain boundary. While still located within the footprint of the OU-1/OU-2 investigation area, the locations are outside of the 100-year floodplain. PAHs are not considered to be Site-related COPCs.

In Sediment: PAH data for OU-1/OU-2 sediments are summarized in Table G-8 and shown on Figure G-5. For PAHs in sediment, the reporting limit is the screening value, so that when PAHs were detected in sediment, they were usually above the screening level. Sediment concentrations were generally low tending to be lower than Fort McClellan background and significantly below OU-1/OU-2 soil and background concentrations. Only one PAH compound in one sample was slightly above twice Fort McClellan background (naphthalene maximum concentration is 38 micrograms per kilogram (μg/kg), twice Fort McClellan background is 33 μg/kg). No OU-1/OU-2 PAH in sediment concentrations were above twice the mean background concentrations PAH concentrations in OU-1/OU-2 background sediments (from Snow Creek upstream of the 11th Street Ditch and from the West 9th Street Creek) are higher in concentration than those found in Snow Creek downstream of its confluence with the 11th Street Ditch.

#### G.1.6.5 PCDD/DFs

**In Soil:** OU-1/OU-2 PCDD/DF in soil data are summarized in Table G-9 and shown in plan view on Figure G-6. PCDD/DF TEQ concentrations are shown on Figure G-7. The distribution of concentrations of PCDD/DFs is random with no evident pattern to the sporadic higher concentrations in the Snow Creek floodplain. Because the analytical method is so sensitive, extremely low levels are able to be detected; the highest PCDD/DF TEQ is 2.2 μg/kg and is from a soil sample with a PCB concentration of 0.6 mg/kg. Figures G-8 and G-9 plot the concentrations of total PCDD/DFs and TEQ as a function of total Aroclor concentration and

show that there is no relationship between PCB and PCDD/DF or TEQ concentrations. The elevated PCDD/DF and TEQ concentration samples are generally not collocated with the higher PCB concentrations samples. The pattern of PCDD/DF concentrations suggests that they are the result of local anthropogenic background and not from a single source and migration pathway. PCDD/DFs could be present as a result of general atmospheric dispersion and from multiple industrial sources in the region.

**In Sediment:** PCDD/DFs in OU-1/OU-2 sediments are summarized in Table G-10. Sediment PCDD/DF concentrations are also shown along with soil PCDD/DF concentrations on Figures G-6 through G-9. Concentrations of PCDD/DFs in sediment are low indicating that concentrations are representative of background conditions rather than from a point source. The distribution appears to be random, and the PCDD/DF concentrations are not related to the patterns associated with PCBs. The PCDD/DF concentrations and distribution pattern are not the same as would be expected if from a point source. PCDD/DFs could be present as a result of general atmospheric dispersion and/or may be from multiple industrial sources in the area.

#### **G.1.6.6** Metals

**In Soil:** Metals in OU-1/OU-2 soils are summarized in Table G-11. Eight metals (aluminum, barium, beryllium, copper, nickel, selenium, silver, and zinc) are not COPCs in soil because they were not detected at concentrations above screening levels. Calcium, magnesium, potassium, and sodium were also not included as COPCs, as these are common nutrients and do not have applicable screening levels. Calcium and magnesium concentrations in soil (and sediment) are higher than background concentrations although the maximum inside of OU-1/OU-2 is within a factor of 2 of the maximum outside of OU-1/OU-2. Potassium and sodium concentrations in soil are generally consistent with background.

In Sediment: Metals in OU-1/OU-2 sediments are summarized in Table G-12. Two metals (antimony and silver) are not considered COPCs in sediment because they were not reported above screening levels. Seven metals (aluminum, beryllium, calcium, magnesium, potassium, sodium, and thallium) do not have applicable screening levels and do not appear to be of concern based on a comparison with background sediment and/or soil concentrations. Sodium was not detected in sediment, and aluminum and potassium had concentrations less than twice the mean Fort McClellan background concentrations, indicating that these concentrations are consistent with naturally occurring background. Consistent with soil concentrations, calcium and magnesium (common nutrients) concentrations in OU-1/OU-2 sediment were higher than background concentrations, but were within a factor of 2 of maximum background. Beryllium concentrations were above background concentrations but were significantly lower than the human health soil screening levels and overall concentrations were low (maximum is 4.2 mg/kg). Thallium concentrations in sediment were below OU-1/OU-2 background concentrations in soil.

Metals figures (Figures G-10 through G-31) are organized in alphabetical order by metal and include, where needed for explanation, frequency distributions in soil inside and outside of OU-1/OU-2. A plan view presentation of soil concentrations and a plot of sediment concentrations as a function of distance from OU-3 (upstream from Lake Logan Martin). The distribution presentations are helpful in understanding the magnitude and frequency of concentrations

above the screening level(s). The distribution figures are also useful in understanding whether the concentrations of a constituent are the result of naturally occurring background (i.e., the two distributions are similar) or if the constituent may be present in background due to an anthropogenic source (i.e., the distributions inside and outside of OU-1/OU-2 are similar or constituent concentrations outside of the OU-1/OU-2 footprint are higher). The figures can also be used to assess the similarity of the constituent distributions relative to the distribution of PCBs (Figure G-2) to further evaluate whether they are possibly from sources other than the Facility. Figures with constituent distributions in sediment for Snow Creek are provided and are used to show the influence of the upstream watershed. These show where the use of constituents in areas outside the hydraulic influence of the Facility has influenced the presence and concentration within the footprint of OU-1/OU-2. Other metals with detected concentrations above screening levels or background are discussed individually below.

**Antimony in soil:** The antimony concentration in only one sample (<1%) exceeded the screening level of 31 mg/kg with a maximum concentration of 33 mg/kg. The OU-1/OU-2 maximum antimony concentration is higher than naturally occurring Fort McClellan background concentrations, but is significantly lower than the OU-1/OU-2 background maximum of 360 mg/kg, indicating sporadic, elevated concentrations from source(s) outside of OU-1/OU-2.

Arsenic in soil: OU-1/OU-2 arsenic concentrations are similar to OU-1/OU-2 background arsenic concentrations (Figures G-10 and G-11) and Fort McClellan background arsenic concentrations. The mean arsenic concentrations for Fort McClellan background (8 mg/kg), OU-1/OU-2 background (8 mg/kg) and OU-1/OU-2 soil (11 mg/kg) are similar. The maximum arsenic concentration of 120 mg/kg was detected inside and outside of OU-1/OU2 and is higher than the Fort McClellan maximum of 49 mg/kg. OU-1/OU-2 arsenic soil concentrations might be affected by source(s) of arsenic inside or outside of OU-1/OU-2 (see the higher end of the frequency distribution, Figure G-10). Overall, arsenic concentrations in OU-1/OU-2 soil are consistent with background concentrations and are not indicative of a source area or release.

**Arsenic in sediment:** The presence of upstream sources of arsenic in the Snow Creek watershed is demonstrated by the arsenic in sediment data for Snow Creek (Figure G-12). Although some samples were above twice the mean Fort McClellan background of 11 mg/kg, the OU-1/OU-2 maximum of 21 mg/kg is consistent with the Fort McClellan background maximum of 20 mg/kg and significantly lower than the OU-1/OU-2 background maximum of 71 mg/kg. None were reported above twice the mean OU-1/OU-2 background. Arsenic may be present in OU-1/OU-2 sediments from naturally occurring or anthropogenic sources.

**Barium in sediment:** A screening level for barium in sediment was not available for this evaluation, and barium results are compared with the soil screening level and background concentrations. Barium was detected in soil and sediment samples at similar concentrations and significantly below the human health soil screening level of 15,000 mg/kg. The mean barium concentration reported in soil was 140 mg/kg and in sediment was 180 mg/kg. The maximum barium concentration reported in soil was 1,700 mg/kg and in sediment was 580 mg/kg. The distribution of barium in soil (Figure G-13) suggests a source of barium outside of OU-1/OU-2. Based on Fort McClellan soil background concentrations (mean is 88 mg/kg, maximum is 4,500

mg/kg), barium concentrations in sediment are likely attributable to naturally occurring or anthropogenic background.

**Cadmium in soil:** The cadmium concentration in only one sample (with a maximum of 72 mg/kg) exceeded the screening level of 70 mg/kg. The OU-1/OU-2 mean cadmium concentration is consistent with the OU-1/OU-2 background mean cadmium concentration, and the OU-1/OU-2 maximum cadmium concentration (72 mg/kg) is slightly lower than the OU-1/OU-2 background maximum concentration (of 94 mg/kg). Cadmium distribution patterns inside and outside of OU-1/OU-2 are similar with only a few isolated occurrences above the screening level (Figure G-14). In general, cadmium concentrations are low, with a few isolated elevated concentrations, similar to background concentrations.

**Cadmium in sediment:** Only two samples were higher than the sediment screening level of 1 mg/kg with a maximum concentration of 4.6 mg/kg, and this was also the only sample above twice the mean OU-1/OU-2 background (of 3.9 mg/kg). Sediment collected from upstream of OU-1/OU-2 are a little higher (maximum = 8.2 mg/kg) than those collected from OU-1/OU-2 (Figure G-15). As noted for soils, it appears anthropogenic source(s) of cadmium may be present in the Anniston area (maximum soil background = 94 mg/kg) and these may be contributing relatively low levels of cadmium to OU-1/OU-2 sediments.

**Chromium in soil:** Chromium soil screening levels are valence-state dependent and are not included on Table G-11 for comparison with total chromium data. The distribution of chromium in OU-1/OU-2 soils is shown on Figures G-16 and G-17. The OU-/OU-2 average chromium concentration is driven by two elevated points of 14,000 and 850 mg/kg. If these two high points are removed, the average would be 39 mg/kg and the maximum would be 550 mg/kg, consistent with OU-1/OU-2 background. Chromium was not identified as a concern for OU-3, and as shown on Figure G-17, the source for chromium is not OU-3.

**Chromium in sediment:** The distribution of chromium concentrations in sediment is shown on Figure G-18. Chromium concentrations in sediments from Snow Creek upstream of the 11th Street Ditch and from the West 9th Street Creek are higher in concentration than those found in Snow Creek downstream of its confluence with the 11th Street Ditch. Chromium concentrations inside and outside of OU-1/OU-2 appear attributable to anthropogenic sources of chromium in and around the Anniston area.

**Cobalt in soil:** Cobalt was detected above the screening level in only 7% of the soil samples. OU-1/OU-2 background cobalt concentrations are higher than Fort McClellan background cobalt concentrations, suggesting an anthropogenic source of cobalt to the area. OU-1/OU-2 cobalt concentrations are more typical of Fort McClellan background concentrations and are lower than OU-1/OU-2 background concentrations, indicating that concentrations inside of OU-1/OU-2 are primarily associated with naturally occurring background (Figure G-19).

**Cobalt in sediment:** Concentrations of cobalt in OU-1/OU-2 sediment are shown on Figure G-20. The mean and maximum detected in sediment were 26 mg/kg and 110 mg/kg, respectively. Only two samples were reported with cobalt concentrations above the screening level of 50 mg/kg and the maximum was 110 mg/kg. Although the two sample results were higher than sediment background, the other sediment concentrations are consistent with upstream

concentrations. They are also consistent with OU-1/OU-2 background soil cobalt concentrations (mean is12 mg/kg, maximum is 50 mg/kg). Although two sediment samples were reported above the screening level, the cobalt concentrations do not indicate a significant release and cobalt is likely present as a result of background conditions.

**Copper in sediment:** The distribution of copper in Snow Creek is shown on Figure G-21. No samples were reported above twice the mean OU-1/OU-2 background. Concentrations upstream in Snow Creek and in soils from outside of OU-1/OU-2 indicate source(s) of copper that are not Site related. The highest concentration in OU-1/OU-2 sediment of 230 mg/kg is significantly less than the highest upstream concentration of 1,300 mg/kg and the OU-1/OU-2 soil maximum background concentration of 17,000 mg/kg.

**Iron in soil:** The OU-1/OU-2 mean concentration for iron is consistent with the background mean concentration, although the OU-1/OU-2 maximum iron concentration (580,000 mg/kg) indicates sporadic occurrences of elevated concentrations. Concentrations of iron in OU-1/OU-2 and in the surrounding area are attributable to multiple non-Site-related uses of iron in the area.

**Iron in sediment:** Concentrations of iron in sediment are slightly elevated, reflecting the potential influence of the multiple uses of iron in the area and upland soil concentrations.

**Lead in soil:** OU-1/OU-2 background lead concentrations and OU-1/OU-2 lead concentrations are higher than Fort McClellan background lead concentrations, indicating anthropogenic source(s) of lead in the area. The OU-1/OU-2 maximum (30,000 mg/kg) is lower than the OU-1/OU-2 background maximum (87,400 mg/kg). These data and the distribution patterns for lead (Figure G-22) are consistent with potential sources of lead in the area that are not Facility related.

**Lead in sediment:** Lead concentrations in OU-1/OU-2 sediment are shown on Figure G-23. Mean and maximum concentrations are lower than OU-1/OU-2 background. The mean (72 mg/kg) and maximum (510 mg/kg) concentrations are relatively low in comparison with the residential cleanup goal of 400 mg/kg in soil, and only the maximum concentration sample (510 mg/kg) was above twice the mean OU-1/OU-2 background concentration of 345 mg/kg. As shown on Figure G-23, the single high point of 510 mg/kg is a single, somewhat anomalous result in an otherwise low concentration, decreasing trend that originates upstream of the Facility. As with the soils data, the sediment data are consistent with the historical use of lead and the industrial character of the area.

**Manganese in soil:** A human health soil screening level is not available for manganese. OU-1/OU-2 manganese concentrations are consistent with or slightly lower than background manganese concentrations (Figure G-24). The OU-1/OU-2 mean is comparable with mean background, and the OU-1/OU-2 maximum (10,100 mg/kg) is significantly less than the OU-1/OU-2 (36.000 mg/kg) and Fort McClellan (19,000 mg/kg) background maximums. Concentrations of manganese may be attributed to naturally occurring or anthropogenic background and do not appear to originate inside of OU-1/OU-2 or OU-3.

**Manganese in sediment:** Manganese in sediment data are summarized in Table G-12. OU-1/OU-2 sediment background manganese concentrations (mean is 951 mg/kg, maximum is

7,500 mg/kg) are higher than Fort McClellan background manganese concentration, indicating a local anthropogenic source(s) of manganese. OU-1/OU-2 concentrations (mean is 1,800 mg/kg, maximum is 5,200 mg/kg) are generally consistent with OU-1/OU-2 sediment background and with OU-1/OU-2 soil background (mean is 1,270 mg/kg, maximum is 36,000 mg/kg). Concentrations could be associated with local anthropogenic sources, but do not appear to originate in OU-3.

**Mercury in soil:** OU-1/OU-2 mercury concentrations in soil are higher than Fort McClellan background mercury concentrations in soil, and the distribution of concentrations is variable inside and outside of OU-1/OU-2 (Figure G-25). Because so few of the concentrations in soil (only 2 of 210 samples [1%]) were above the human health screening level of 5.6 mg/kg, mercury was not considered further as a COPC in soil from a human health perspective. Mercury is of interest from an ecological risk perspective in sediment in OU-4 and is discussed here recognizing that potential source(s) to OU-4 include OU-3, and non-Site-related sources inside and outside of OU-1/OU-2. Mercury concentrations in soils are plotted in plan view on Figure G-26. Although the mean mercury concentrations inside and outside of OU-1/OU-2 are comparable (0.42 mg/kg and 0.41 mg/kg, respectively), the maximum soil mercury concentration of 28 mg/kg was detected outside of OU-1/OU-2 and is significantly higher than the maximum soil mercury concentration inside of OU-1/OU-2 of 7.5 mg/kg. These data are indicative of sources of mercury outside of OU-1/OU-2.

**Mercury in sediment:** The majority of samples upstream and in OU-1/OU-2 were less than 1 mg/kg. Only 4 samples were above 1 mg/kg (maximum is 8.6 mg/kg) in OU-1/OU-2 between the 11th Street Ditch and the Route 202 culverts. These higher concentration samples influence the OU-wide mean of 1.1 mg/kg.

**Nickel in sediment:** Nickel concentrations in OU-1/OU-2 sediment are shown on Figure G-27. Concentrations in sediment are highest upstream of the OU in the West 9th Street Creek, with a maximum of 270 mg/kg. In OU-1/OU-2, concentrations are slightly lower with a mean of 35 mg/kg and a maximum of 110 mg/kg. Nickel concentrations in sediment are consistent with the multiple industrial uses of heavy metals in the area.

**Selenium in sediment:** Fort McClellan background, OU-1/OU-2 and OU-1/OU-2 background concentrations are similar, indicating that concentrations are attributable to naturally occurring background. Sediment maximum of 3.4 mg/kg is only slightly above the screening level of 2 mg/kg and twice the mean OU-1/OU-2 background of 2.4 mg/kg.

**Thallium in soil:** OU-1/OU-2 and background means are higher than Fort McClellan background, suggesting anthropogenic source(s) in the Anniston area. The OU-1/OU-2 mean (5.5 mg/kg) is lower than OU-1/OU-2 background (mean = 8.3 mg/kg), and the maximum (30 mg/kg) is lower than the OU-1/OU-2 background maximum (81 mg/kg) indicating that if concentrations are not entirely associated with natural sources, they are possibly associated with low-level industrial background.

**Thallium in sediment:** A sediment screening level was not available for thallium. Concentrations in OU-1/OU-2 sediment are higher than in background sediment and higher than in OU-1/OU-2 soils, but the maximum in sediment (50 mg/kg) is lower than in soils outside

of OU-1/OU-2 (maximum is 81 mg/kg). Thallium concentrations in soil and sediment could be associated with anthropogenic sources inside or outside of OU-1/OU-2.

**Vanadium in soil:** Fort McClellan and OU-1/OU-2 background vanadium concentrations are higher than screening levels. OU-1/OU-2 vanadium concentrations are consistent with background vanadium concentrations. The distributions inside and outside of OU-1/OU-2 soils are similar (Figure G-28), indicating that vanadium concentrations are typical of naturally occurring background conditions.

**Vanadium in sediment:** A vanadium sediment screening level was not available, and the vanadium soil screening level (5.5 mg/kg) is significantly lower than Fort McClellan background vanadium concentrations (soil: mean is 31 mg/kg, maximum is 158 mg/kg; sediment: mean is 20 mg/kg, maximum is 67 mg/kg). OU-1/OU-2 vanadium concentrations in sediment are compared with sediment background vanadium concentrations and with OU-1/OU-2 soil and background vanadium concentrations. Similar to soils, vanadium concentrations in sediment (mean is 31 mg/kg, maximum is 64 mg/kg) are similar to both Fort McClellan (mean is 20 mg/kg, maximum is 67 mg/kg) and OU-1/OU-2 sediment background vanadium concentrations (mean is 30 mg/kg, maximum is 59 mg/kg). The concentrations of vanadium in sediment appear to be attributable to naturally occurring background.

**Zinc in sediment:** The mean OU-1/OU-2 background is higher than Fort McClellan background supporting potential anthropogenic source(s) in the local area. No OU-1/OU-2 samples were detected above twice the mean OU-1/OU-2 background indicating concentrations are consistent with the known use of heavy metals in and around the OU.

# G.1.7 OU-1/OU-2 COPC Summary

This COPC evaluation is based on data collected by P/S and the USEPA and is focused on OU-1/OU-2 with the intent of bringing the Site-specific nature and extent evaluations together in a combined assessment of conditions in OU-1/OU-2. This evaluation is designed to identify specific COPCs to be addressed in the upcoming FS process and subsequent remedial actions for OU-1/OU-2. This evaluation was conducted using the step-wise ASM process developed for the Site in collaboration with the USEPA. The ASM process for COPCs can be summarized as a procedure for assessing whether the pattern and distribution of a chemical constituent can be categorized as follows:

- Present with prevalence and/or concentration that could be of concern
- Appear to be present due to naturally occurring or anthropogenic background
- Appear to be associated with the Facility

Based on this process, the COPC list for soils and sediments in the OU-1/OU-2 FS should be focused on PCBs.

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# **Tables**

Table G-1. OU-1/OU-2 Chemical of Potential Concern Evaluation: Soil VOCs Anniston PCB Site, Anniston, Alabama

Constituent	Screening Level (μg/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (µg/kg)	Maximum (detected) (μg/kg)	Number Above Screening Level (detected)	Notes
1,1,1-Trichloroethane	8,700,000	60	0				VOCs are not COPCs
1.1.2.2-Tetrachloroethane	560	60	0				in OU-1/OU-2 soils.
1,1,2-Trichloro-1,2,2-Trifluoroethane	43,000,000	60	0				Ethylbenzene was the
1,1,2-Trichloroethane	1,100	60	0				only VOC compound
1,1-Dichloroethane	3,300	60	0				detected above the
1,1-Dichloroethene	240,000	60	0				SL in only one
1.2.4-Trichlorobenzene	22,000	74	0				sample.
1,2-Dibromo-3-chloropropane	5	60	0				Sample.
1,2-Dibromoethane	34	60	0				†
1.2-Dichlorobenzene	1,900,000	74	0				†
1,2-Dichloroethane	430	60	0				†
1,2-Dichloroethene (total)	700,000	11	0				1
1,2-Dichloropropane	890	60	0				1
1.3-Dichlorobenzene		74	0			NSL	†
1,4-Dichlorobenzene	2,400	74	0				†
2-Butanone	28,000,000	60	90	37	500	0	†
2-Hexanone	210,000	60	1.7	1.1	1.1	0	<del> </del>
4-Methyl-2-pentanone	5,300,000	60	8.3	13	26	0	<del> </del>
Acetone	61,000,000	60	98	250	2,200	0	<del> </del>
Benzene	1,100	62	31	2.1	6.5	0	
Bromochloromethane	1,100	60	0	Z. I 		NSL	
Bromodichloromethane	270	60	0				
Bromoform		60	0				
Carbon Disulfide	61,000 820.000	60	32			0	
Carbon Tetrachloride	/	60	0	3.0	8.5		
Chlorobenzene	610	60	0				
Chloroethane	290,000	60	0				
Chloroform	15,000,000	60	0				
Chloromethane	290	60	0				
	120,000		0				
cis-1,2-Dichloroethene	160,000	60 60	0			NSL	
cis-1,3-Dichloropropene Cyclohexane		60	8.3	5.0	8	0	
Dibromochloromethane	7,000,000			5.0			
Dichlorodifluoromethane	680	60 60	0				
Ethylbenzene	94,000	62	6.5			1	
,	5,400			3,000	12,000		
Fluorotrichloromethane Isopropylbenzene	790,000	60	5.0	2.1	3.3	0	
,	2,100,000	60 59	5.0 10	3.0 5.2	4 14	NSL	
m,p-Xylenes			_				
Methyl Acetate	78,000,000	60	60	99	950	0	
Methyl Bromide	7,300	60	6.7	2.0	4.2	-	
Methyl tert-butyl ether	43,000	62	0				
Methylcyclohexane	3,400,000	60	6.7	6.7	9.9	0	
Methylene Chloride	11,000	60	0				
o-Xylene	3,800,000	60	5	9.2	16	0	
Styrene	6,300,000	60	5	2.9	3.4	0	
Tetrachloroethene	550	60	0				
Toluene	5,000,000	62	15	4.4	11	0	
trans-1,2-Dichloroethene	150,000	60	0				<b> </b>
trans-1,3-Dichloropropene		60	0	-		NSL	<u> </u>
Trichloroethene	910	60	0				<u> </u>
Vinyl Chloride	60	60	0				<u> </u>
Xylenes (total)	630,000	14	29	11,000	42,000	0	

--: not available or not applicable %: percent

COPCs: constituents of potential concern

NSL: no screening level OU: operable unit SL: screening level

VOCs: volatile organic compounds μg/kg: micrograms per kilogram

Table G-2. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment VOCs Anniston PCB Site, Anniston, Alabama

Constituent	Screening Level (µg/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (μg/kg)	Maximum (detected) (μg/kg)	Number Above Screening Level (detected)	Notes
1,1,1-Trichloroethane	213	7	0		-		Few VOCs were
1,1,2,2-Tetrachloroethane	850	7	0				detected in sediment,
1,1,2-Trichloro-1,2,2-Trifluoroethane		6	0		-		and only benzene was
1,1,2-Trichloroethane	518	7	0				reported above the
1.1-Dichloroethane	1	7	0				SLs in one sample.
1,1-Dichloroethene	31	7	0				VOCs are not COPCs
1,2,4-Trichlorobenzene	5,062	7	0				for OU-1/OU-2.
1,2-Dibromo-3-chloropropane		6	0			NSL	101 00 1/00 2.
1,2-Dibromoethane		6	0			NSL	
1.2-Dichlorobenzene	294	7	0				
1,2-Dichloroethane	260	7	0				
1,2-Dichloropropane	333	7	0				
1,3-Dichlorobenzene	1,315	7	0				
1,4-Dichlorobenzene	318	7	0				
2-Butanone	42	7	57	5.5	7	0	
2-Hexanone	58	7	0	J.J			
4-Methyl-2-pentanone	25	7	0				
Acetone		7	57	42	57	NSL	
Benzene	142	7	43	3,000	9,100	1	
Bromochloromethane		6	0	3,000	9,100	NSL	
Bromodichloromethane		7	0			NSL	
		7					
Bromoform Carbon Disulfide	492 24	7	0 57			0	
				5.8	8.6		
Carbon Tetrachloride	1,450	7	0				
Chlorobenzene	291	7	0			 NOI	
Chloroethane		7	0			NSL	
Chloroform	121	7	0				
Chloromethane		7	0			NSL	
cis-1,2-Dichloroethene	19	7	0				
cis-1,3-Dichloropropene	-	7	0			NSL	
Cyclohexane		6	0			NSL	
Dibromochloromethane		7	0			NSL	
Dichlorodifluoromethane		6	0			NSL	
Ethylbenzene	175	7	0				
Fluorotrichloromethane		6	0			NSL	
Isopropylbenzene	86	6	0				
m,p-Xylenes		4	0			NSL	
Methyl Acetate	-	6	0		-	NSL	
Methyl bromide	1	7	0		1		
Methyl tert-butyl ether		6	0			NSL	
Methylcyclohexane		6	0			NSL	
Methylene Chloride	159	7	0		-		
o-Xylene		6	0			NSL	
Styrene	254	7	0				
Tetrachloroethene	990	7	0		-		
Toluene	1,220	7	0		-		
trans-1,2-Dichloroethene	654	7	0				
trans-1,3-Dichloropropene		7	0			NSL	
Trichloroethene	112	7	0				
Vinyl Chloride	202	7	0				

Notes:
--: not available or not applicable
%: percent
COPCs: constituents of potential concern
NSL: no screening level
OU: operable unit

SL: screening level

VOCs: volatile organic compounds μg/kg: micrograms per kilogram

Table G-3. OU-1/OU-2 Chemical of Potential Concern Evaluation: Soil Pesticides Anniston PCB Site, Anniston ,Alabama

Constituent	Screening Level (µg/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (μg/kg)	Maximum (detected) (μg/kg)	Number Above Screening Level (detected)	Notes
4,4'-DDD	2,000	117	6.0	6.4	16	0	Chlorinated and organo-
4,4'-DDE	1,400	117	37	29	160	0	phosphorous pesticides are not
4,4'-DDT	1,700	117	42	95	2400	1	COPCs for OU-1/OU-2.
Aldrin	29	117	1.7	81	160	1	Pesticides were detected
Alpha-BHC	77	117	0.85	1.4	1.4	0	infrequently and exceeded SLs
alpha-Chlordane		118	15	46	470	NSL	even less frequently. The
Beta-BHC	270	117	1.7	4.0	4.5	0	pesticide detected above SLs
Delta-BHC		117	0	-	-		most frequently was dieldrin (5%
Dieldrin	30	117	14	69	280	7	of the samlpes). Of the other
Endosulfan I		117	0.85	0.69	0.69	NSL	pesticides, only 4,4'-DDT, aldrin,
Endosulfan II		117	0.85	14	14	NSL	and heptachlor were detected
Endosulfan sulfate		117	5.1	9.4	35	NSL	above SLs in only one sample
Endrin	18,000	117	14	29	240	0	each. Furthermore, false positive
Endrin Aldehyde		117	15	18	100	NSL	identification is a possibility and
Endrin Ketone		117	7.7	40	150	NSL	the quantification of pesticides is
Ethyl Parathion	370,000	59	0	-	-		always uncertain and possibly
Gamma-BHC (Lindane)	520	117	2.6	2.6	16	0	biased high when detected in the
Gamma-Chlordane		117	20	20	430	NSL	presence of PCBs. Multiple
Heptachlor	110	117	4.3	4.3	43	1	possible industrial, agricultural,
Heptachlor epoxide	53	117	14	14	15	0	and residential sources of
Methoxychlor	310,000	117	3.4	3.4	39	0	pesticides are present in and
Methyl Parathion	15,000	59	0				around the Anniston area.
o,o,o-Triethylphosphorothioate		59	0	-	-	NSL	Organo-phosphorous pesticides
Sulfotep	31,000	59	0				listed in the Partial Consent
Technical Chlordane	1,600	17	0	-	-		Decree as possible COPCs were
Toxaphene	440	118	0.85	110	110	0	not detected in OU-1/OU-2.

--: not available or not applicable

%: percent

COPCs: constituents of potential concern

NSL: no screening level OU: operable unit

PCBs: polychlorinated biphenyls

SL: screening level µg/kg: micrograms per kilogram

Table G-4. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment Pesticides
Anniston PCB Site, Anniston, Alabama

Constituent	Screening Level (µg/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (μg/kg)	Maximum (detected) (μg/kg)	Number Above Screening Level (detected)	Notes
4,4'-DDD	3.3	7	0				Chlorinated and OP pesticides
4,4'-DDE	3.3	7	0				are not COPCs for OU-1/OU-2.
4,4'-DDT	3.3	7	57	56	110	4	Region 4 SLs are the same as
Aldrin	2.0	7	43	30	51	3	analytical reporting limits, so
Alpha-BHC	6.0	7	0				low concentrations are above
alpha-Chlordane	1.7	7	29	2.3	2.6	2	screening levels.
Beta-BHC	5.0	7	14	8.9	8.9	1	Concentrations reported are
Delta-BHC	7150	7	14	4.0	4	0	relatively low, the highest being
Dieldrin	3.3	7	43	37	68	3	110 μg/kg (4,4'-DDT). These
Endosulfan I	3.3	7	0	-	-		concentrations are
Endosulfan II	1.9	7	14	6.9	6.9	1	representative of common
Endosulfan sulfate	34.6	7	0	-	-		industrial and agricultural
Endrin	3.3	7	0	-	-		routine use of pesticides. The
Endrin Aldehyde	480	5	20	7.5	7.5	0	concentration and distribution of
Endrin Ketone	-	7	0	-	-	NSL	pesticides do not indicate a
Ethyl Parathion	0.76	4	0	-	-		point source or release. OP
Gamma-BHC (Lindane)	3.3	7	29	2.3	2.8	0	pesticides listed as potential
Gamma-Chlordane	1.7	7	14	1.9	1.9	1	COPCs in the Partial Consent
Heptachlor	0.60	7	0	-			Decree were not detected in OU-
Heptachlor epoxide	2.5	7	57	16	27	4	1/OU-2.
Methoxychlor	14	7	0	-	-		
Methyl Parathion		4	0			NSL	
o,o,o-Triethylphosphorothioate	189	4	0				
Sulfotep	-	4	0			NSL	
Toxaphene	0.08	7	0	-			

--: not available or not applicable

%: percent

COPCs: constituents of potential concern

NSL: no screening level OU: operable unit SL: screening level

Table G-5. OU-1/OU-2 Chemical of Potential Concern Evaluation: Soil SVOCs other than PAHs Anniston PCB Site, Anniston, Alabama

Constituent	Screening Level (µg/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (μg/kg)	Maximum (detected) (μg/kg)	Number Above Screening Level (detected)	Notes
1,1'-Biphenyl	3,900,000	107	15	91	670	0	SVOCs are not COPCs
2,2'-oxybis(1-Chloropropane)	4,600	59	0				for OU-1/OU-2. Only
2,4,5-Trichlorophenol	6,100,000	121	0				four SVOC compounds
2,4,6-Trichlorophenol	44,000	121	0				(bis(2-
2,4-Dichlorophenol	180,000	121	0				ethylhexyl)phthalate,
2,4-Dimethylphenol	1,200,000	121	0				carbazole,
2,4-Dinitrophenol	120,000	121	0				dibenzofuran, and
2,4-Dinitrotoluene	1,600	121	0				pentachlorophenol)
2,6-Dinitrotoluene	61,000	121	0				were reported above
2-Chlorophenol	390,000	121	0				SLs and these in fewer
2-Methylphenol	3,100,000	121	0.82	99	99	0	than 3% of samples.
2-Nitroaniline	610,000	121	0				a 676 61 64p.661
2-Nitrophenol		121	0			NSL	
3,3'-Dichlorobenzidine	1,100	121	0				
3-Nitroaniline		121	0			NSL	
4,6-Dinitro-2-methylphenol	4,900	121	0				
4-Bromophenyl-phenylether		121	0			NSL	
4-Chloro-3-methylphenol	6,100,000	121	0				
4-Chloroaniline	2,400	121	0				
4-Chlorophenyl-phenylether		121	0			NSL	
4-Methylphenol	310.000	59	1.7	41	41	0	
4-Nitroaniline	24,000	121	1.7	58	62	0	
4-Nitrophenol		121	0			NSL	
Acetophenone	7,800,000	107	9.3	84	310	0	
Atrazine	2,100	107	0	<u> </u>	0.0		
Benzaldehyde	7,800,000	107	12	110	280	0	
bis(2-Chloroethoxy)methane	180,000	121	0				
bis(2-Chloroethyl)ether	210	121	0				
bis(2-Ethylhexyl)phthalate	35,000	121	48	3,100	57,000	3	
Butylbenzylphthalate	260,000	121	13	750	2,700	0	
Caprolactam	31,000,000	107	0				
Carbazole	24,000	121	43	32,000	1,400,000	2	
Dibenzofuran	78,000	121	28	23,000	600,000	2	
Diethylphthalate	49,000,000	121	0.83	5,000	5,000	0	
Dimethylphthalate		121	1.7	400	490	NSL	
Di-n-Butylphthalate	6,100,000	121	6.6	540	1,800	0	
Di-n-octylphthalate		121	1.7	1,800	3,500	NSL	
Hexachlorobenzene	300	121	0				
Hexachlorobutadiene	6,200	121	0				
Hexachlorocyclopentadiene	370,000	121	0				
Hexachloroethane	12.000	121	0				
Isophorone	510,000	121	0				
Nitrobenzene	4,800	121	0				
N-Nitroso-di-n-propylamine	69	120	0				
N-Nitrosodiphenylamine	99,000	59	0				
Pentachlorophenol	890	121	1.7	10,000	19,000	2	
Phenol	18,000,000	121	5.0	280	1,200	0	
i nenoi	10,000,000	121	5.0	200	1,200	U	

--: not available or not applicable

%: percent COPCs: constituents of potential concern

NSL: no screening level

OU: operable unit

PAHs: polycyclic aromatic compounds

SL: screening level

SVOCs: semivolatile organic compounds

Table G-6. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment SVOCs other than PAHs Anniston PCB Site, Anniston, Alabama

Constituent	Screening Level (µg/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (μg/kg)	Maximum (detected) (µg/kg)	Number Above Screening Level (detected)	Notes
1,1'-Biphenyl	1,220	6	17	38	38	0	Few SVOCs were
2,2'-oxybis(1-Chloropropane)		4	0			NSL	detected in sediment and
2,4,5-Trichlorophenol		7	0			NSL	none were reported
2,4,6-Trichlorophenol	208	7	0				above SLs. SVOCs are
2,4-Dichlorophenol	81.7	7	0				not COPCs for OU-1/OU-
2,4-Dimethylphenol	304	7	0				2.
2,4-Dinitrophenol	6.21	7	0				1
2,4-Dinitrotoluene	14.4	7	0				1
2,6-Dinitrotoluene	39.8	7	0				1
2-Chlorophenol	31.9	7	0			-	1
2-Methylphenol	55.4	7	0				1
2-Nitroaniline		7	0			NSL	1
2-Nitrophenol		7	0			NSL	†
3,3'-Dichlorobenzidine	127	7	0				1
3-Nitroaniline		7	0			NSL	†
4,6-Dinitro-2-methylphenol	104	7	0				†
4-Bromophenyl-phenylether	1,550	7	0				†
4-Chloro-3-methylphenol	388	7	0				1
4-Chloroaniline	146	7	0				1
4-Chlorophenyl-phenylether		7	0			NSL	1
4-Methylphenol	670	4	0				1
4-Nitroaniline		7	0			NSL	1
4-Nitrophenol	13.3	7	0				1
Acetophenone		6	0			NSL	1
Atrazine	6.62	6	0				1
Benzaldehyde		6	0			NSL	-
bis(2-Chloroethoxy)methane		7	0			NSL	-
bis(2-Chloroethyl)ether	3,520	7	0				-
bis(2-Ethylhexyl)phthalate	182	7	57	130	180	0	1
Butylbenzylphthalate	1,970	7	14	470	470	0	-
Caprolactam		6	0			NSL	-
Carbazole		7	57	69	170	NSL	1
Dibenzofuran	449	7	14	56	56	0	1
Diethylphthalate	295	7	0				1
Dimethylphthalate		7	0				1
Di-n-Butylphthalate	1,114	7	0				1
Di-n-octylphthalate	4,060	7	0				1
Hexachlorobenzene	20	7	0				1
Hexachlorobutadiene	26.5	7	0				-
Hexachlorocyclopentadiene	901	7	0				-
Hexachloroethane	584	7	0				1
Isophorone	432	7	0				1
Nitrobenzene	145	7	0				1
N-Nitroso-di-n-propylamine		7	0			NSL	1
N-Nitrosodiphenylamine	2,680	4	0			INOL 	1
Pentachlorophenol	2,000	7	0				1
	20	. /	U				

--: not available or not applicable

%: percent

COPCs: constituents of potential concern

NSL: no screening level OU: operable unit

PAHs: polycyclic aromatic compounds

SL: screening level

SVOCs: semivolatile organic compounds

Table G-7. OU-1/OU-2 Chemical of Potential Concern Evaluation: Soil PAHs Anniston PCB Site, Anniston, Alabama

Constituent	Screening Level (µg/kg)	2x Mean FM Background (μg/kg)	2x Mean OU-1/OU-2 Background (μg/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (µg/kg)	Maximum (detected) (μg/kg)	Number Above Screening Level (detected)	Number Above 2x Mean FM background (detected)	Number Above 2x Mean OU-1/OU-2 Background (detected)	Notes
2-Chloronaphthalene	6,300,000			121	0	-	-				PAH concentrations in
2-Methylnaphthalene	310,000		270,156	123	33	13,000	380,000	1	0	1	soil appeaer to be
Acenaphthene	3,400,000	702	426,705	121	29	13,000	370,000	0	7	0	attributable to urban background. OU-1/OU-2
Acenaphthylene		891	361	121	26	160	680	NSL	0	5	maximum concentrations
Anthracene	17,000,000	935	184,358	121	58	21,000	1,200,000	0	13	2	are higher than OU-3
Benzo(a)anthracene	150	1,193	78,609	121	89	79,000	900,000	82	35	2	maximum concentrations,
Benzo(a)pyrene	15	1,420	66,497	121	88	6,800	400,000	107	26	3	indicating sources of
Benzo(b)fluoranthene	150	1,659	47,972	121	89	6,400	340,000	90	29	3	PAHs to OU-/OU-2 other than OU-3. PAHs are
Benzo(g,h,i)perylene		955	37,208	121	79	1,200	54,000	NSL	20	1	likely present from
Benzo(k)fluoranthene	1,500	1,446	67,626	121	87	68,000	380,000	25	30	2	mulitple urban and
Chrysene	15,000	1,397	61,100	121	90	12,000	810,000	3	35	3	industrial uses in the
Dibenzo(a,h)anthracene	15	720	2,095	121	33	390	2,800	40	7		area. Figure G-5 shows
Fluoranthene	2,300,000	2,031	146,034	121	91	30,000	2,300,000	0	37	3	PAH distributions inside
Fluorene	2,300,000	667	633,410	121	33	41,000	1,300,000	0	11	1	and outside of OU-1/OU- 2 and shows elevated
Indeno(1,2,3-cd)pyrene	150	937	34,487	121	82	1,600	45,000	63	23	2	concentrations of PAHs
Naphthalene	3,600	33	910,071	121	36	32,000	1,100,000	2	35	1	outside of the influence of
Phenanthrene		1,080	498,845	121	86	50,000	4,100,000	NSL	32	2	the facility and creek
Pyrene	1,700,000	1,626	115,028	121	91	21,000	1,600,000	0	39	3	flooding.
Total PAHs		17,700	1,371,911	121	91	1,400,000	15,000,000	NSL	27	2	

Total PAHs were calculated as the sum of the detected values, nondetects were treated as 0.

--: not available or not applicable

%: percent

COPCs: constituents of potential concern

FM: Fort McClellan NSL: no screening level OU: operable unit

PAHs: polycyclic aromatic compounds

SL: screening level

Table G-8. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment PAHs Anniston PCB Site, Anniston, Alabama

Constituent	Screening Level (µg/kg)	2x Mean FM Background (μg/kg)	2x Mean OU-1/OU-2 Background (μg/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (µg/kg)	Maximum (detected) (µg/kg)	Number Above Screening Level (detected)	Number Above 2x Mean FM background (detected)	Number Above 2x Mean OU-1/OU-2 Background (detected)	Notes
2-Chloronaphthalene	330			7	0						Region 4 SLs are the
2-Methylnaphthalene	330		2,033,713	7	14	27	27	0	0	0	analytical reporting limit,
Acenaphthene	330	702	2,361,143	7	14	41	41	0	0	0	so when PAHs were
Acenaphthylene	330	891	337,200	7	29	26	32	0	0	0	detected, the were often
Anthracene	330	935	1,611,978	7	57	110	150	0	0	0	above the reporting limit
Benzo(a)anthracene	330	1,193	2,245,558	7	71	450	670	3	0	0	and the SL. Only one
Benzo(a)pyrene	330	1,420	1,593,435	7	71	408	720	2	0	0	sample had one PAH
Benzo(b)fluoranthene	330	1,659	1,997,518	7	71	550	1,100	3	0	0	(naphthalene) detected
Benzo(g,h,i)perylene	330	955	845,408	7	71	240	550	1	0	0	above 2x the mean FM
Benzo(k)fluoranthene	330	1,446	749,782	7	71	400	730	2	0		background, and no
Chrysene	330	1,397	1,666,210	7	71	520	810	5	0		samples were above 2x
Dibenzo(a,h)anthracene	330	720	530,800	7	57	43	58	0	0	Ü	the mean OU-1/OU-2
Fluoranthene	330	2,031	7,260,667	7	71	1,006	1,600	5	0	•	background. PAHs are
Fluorene	330	667	3,701,100	7	57	44	100	0	0		likely present from
Indeno(1,2,3-cd)pyrene	330	937	761,905	7	71	220	490	1	0		multiple urban and
Naphthalene	330	33	7,776,343	7	14	38	38	0	1	0	industrial uses in the area.
Phenanthrene	330	1,080	8,537,317	7	71	500	1,000	3	0	0	
Pyrene	330	1,626	4,447,818	7	71	920	1,500	5	0	0	
Total PAHs	330		41,076,853	7	71	5,400	8,300	5		0	

Total PAHs were calculated as the sum of the detected values, nondetects were treated as 0.

--: not available or not applicable

%: percent

COPCs: constituents of potential concern

FM: Fort McClellan OU: operable unit

PAHs: polycyclic aromatic compounds

SL: screening level

Table G-9. OU-1/OU-2 Chemical of Potential Concern Evaluation: Soil PCDD/DFs Anniston PCB Site, Anniston, Alabama

Constituent	Screening Level (ng/kg)	2x Mean OU-1/OU-2 Background (ng/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (ng/kg)	Maximum (detected) (ng/kg)	Number Above Screening Level (detected)	Number Above 2x Mean OU-1/OU-2 Background (detected)	Notes
2,3,7,8-TCDD	4.5		57	19	12	35	5		The distribution of
1,2,3,7,8-PeCDD			57	33	17	110	NSL		concentrations of
1,2,3,4,7,8-HxCDD	-	4	57	60	14	130	NSL	12	PCDD/DFs is random
1,2,3,6,7,8-HxCDD		16	57	84	86	2,900	NSL	11	with no evident pattern
1,2,3,7,8,9-HxCDD	-	13	57	86	26	300	NSL	12	to the sporadic higher
1,2,3,4,6,7,8-HpCDD	-	213	57	100	2,700	130,000	NSL	16	concentrations in the
Octa CDD	13,000	3,918	57	100	20,000	900,000	4	15	Snow Creek floodplain.
2,3,7,8-TCDF	32		57	56	52	400	8		The highest PCDD/DF
1,2,3,7,8-PeCDF	110	9	57	42	20	84	0	11	TEQ is 2.2 μg/kg (2,200
2,3,4,7,8-PeCDF	11	12	57	60	37	310	14	14	ng/kg). PCDD/DF
1,2,3,4,7,8-HxCDF		52	57	88	40	330	NSL	12	concentrations do not
1,2,3,6,7,8-HxCDF		30	57	77	24	120	NSL	14	exhibit the same pattern
1,2,3,7,8,9-HxCDF		1	57	25	5.1	12	NSL	11	of source and
2,3,4,6,7,8-HxCDF		16	57	82	18	100	NSL	15	distribution as PCBs.
1,2,3,4,6,7,8-HpCDF		93	57	49	970	22,000	NSL	15	PCDD/DFs could be
1,2,3,4,7,8,9-HpCDF		6	57	74	35	730	NSL	22	present as a result of
Octa CDF	11,000	130	57	91	1,200	53,000	1	17	general atmospheric
Total Tetra CDD		18	57	65	24	170	NSL	15	dispersion and from
Total Penta CDD	3.9	25	57	46	52	270	19	11	multiple industrial
Total Hexa CDD	39	81	57	98	310	9,900	25	17	sources in the region.
Total Hepta CDD	390	446	57	100	5,000	240,000	18	17	PCDD/DFs are not
Total Tetra CDF		101	57	93	320	1,800	NSL	26	COPCs in OU-1/OU-2.
Total Penta CDF		133	57	98	440	4,600	NSL	29	
Total Hexa CDF	32	151	57	98	520	14,900	41	20	
Total Hepta CDF	320	198	57	93	2,200	106,000	13	15	
PCDD/DF TEQ	4.5	6	57	100	73	2,200	38	35	
Total PCDD/DF		4813	57	100	29,000	1,300,000	NSL	20	

--: not available or not applicable

%: percent

COPCs: constituents of potential concern

ng/kg: nanograms per kilogram NSL: no screening level OU: operable unit

PCBs: polychlorinated biphenyls
PCDD/DF: polychlorinated dibenzo-p-dioxins/dibenzofurans
PCDD/DF TEQ = 2,3,7,8-TCDD toxicity equivalent (USEPA 2010)

Table G-10. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment PCDD/DFs Anniston PCB Site, Anniston, Alabama

Constituent	Screening Concentration (ng/kg)	Number of Samples	Detection Frequency (%)	Mean (detected) (ng/kg)	Maximum (detected) (ng/kg)	Number Above Screening Level (detected)	Notes
2,3,7,8-TCDD	3	4	0	1			The concentration in sediments are low with
1,2,3,7,8-PeCDD		4	0	-		NSL	little difference between the mean and
1,2,3,4,7,8-HxCDD		4	0	ŀ		NSL	maximum values. The distribution of
1,2,3,6,7,8-HxCDD		4	75	1.9	3.1	NSL	concentrations appears random and not
1,2,3,7,8,9-HxCDD		4	25	2.3	2.3	NSL	related to the patterns associated with PCBs.
1,2,3,4,6,7,8-HpCDD		4	100	23	26	NSL	PCDD/DFs could be present as a result of
Octa CDD	11	4	100	220	260	4	general atmospheric dispersion and/or may
2,3,7,8-TCDF		4	50	13	18	NSL	be from multiple industrial sources in the
1,2,3,7,8-PeCDF		4	25	13	13	NSL	area.
2,3,4,7,8-PeCDF		4	75	33	82	NSL	
1,2,3,4,7,8-HxCDF		4	100	24	74	NSL	
1,2,3,6,7,8-HxCDF		4	100	6.6	20	NSL	
1,2,3,7,8,9-HxCDF		4	25	2.7	2.7	NSL	
2,3,4,6,7,8-HxCDF		4	100	3.9	10	NSL	
1,2,3,4,6,7,8-HpCDF		4	0			NSL	
1,2,3,4,7,8,9-HpCDF		4	75	16	41	NSL	
Octa CDF		4	100	40	110	NSL	
Total Tetra CDD	11	4	50	4.1	4.2	0	
Total Penta CDD	11	4	0				
Total Hexa CDD	11	4	100	6.4	13	1	
Total Hepta CDD	11	4	100	49	56	4	
Total Tetra CDF		4	100	380	810	NSL	
Total Penta CDF		4	100	360	1,100	NSL	
Total Hexa CDF		4	100	85	270	NSL	
Total Hepta CDF		4	100	36	110	NSL	
PCDD/DF TEQ	3	4	100	12	36	3	
Total PCDD/DF		4	100	1,200	2,800	NSL	

--: not available or not applicable

%: percent

ng/kg: nanograms per kilogram NSL: no screening level

OU: operable unit PCBs: polychlorinated biphenyls

PCDD/DF: polychlorinated dibenzo-p-dioxins/dibenzofurans
PCDD/DF TEQ = 2,3,7,8-TCDD toxicity equivalent (USEPA 2010)

Table G-11. OU-1/OU-2 Chemical of Potential Concern Evaluation: Soil Metals
Anniston PCB Site, Anniston, Alabama

		F	M Backgro	und (mg/kg)	OU-1/OU	-2 Backgro	ound (mg/kg)				OU-1/OU-2 Data	<u> </u>			
Constituent	Screening Level (mg/kg)	Mean	2x Mean	Maximum	Mean	2x Mean	Maximum	Number of Samples	Detection Frequency (%)	Mean (detected) (mg/kg)	Maximum (mg/kg)	Number Above Screening Level (detected)	Number Above 2x Mean FM Background (detected)	Number Above 2x Mean OU- 1/OU-2 Background (detected)	Notes
Aluminum	77,000	7,505	15,009	39,900	7,959	15,918	54,000	119	100	8,800	29,000	0	9		No sample exceeded the SL. Data are generally consistent with background.
Antimony	31	0.83	1.66	2.6	6.69	13.4	360	127	35	3.3	33	1	23	2	Only one sample (<1%, 33 mg/kg) exceeded the SL of 31 mg/kg, and the mean of 3.29 is significantly lower than the SL. The OU-1/OU-2 max is higher than naturally occurring (FM) background, but is significantly lower than the OU-1/OU-2 background max, indicating sporadic elevated concentrations from a source outside of OU-1/OU-2.
Arsenic	0.39	7.99	15.97	49	8.42	16.8	120	194	99	11	120	192	25	24	OU-1/OU-2 concentrations are the same as local background. FM, OU-1/OU-2 background and OU-1/OU-2 means are similar. OU-1/OU-2 background and OU-1/OU-2 maximums are higher than the FM maximum suggesting anthropogenic source(s) of arsenic inside or outside of OU-1/OU-2.
Barium	15,000	88	176	4,500	213	426	12,000	186	99	140	1,700	0	42	6	None above SL.
Beryllium	160	0.42	0.83	2	1.31	2.61	10	127	69	0.83	2.7	0	37	1	None above SL.
Cadmium	70	0.13	0.25	1.3	2.01	4.03	94	194	80	2.9	72	1	140	18	Only one sample (1%) was slightly higher (72 mg/kg) than the SL of 70 mg/kg and slightly lower than the OU-1/OU-2 background max (94 mg/kg). Maximum concentrations suggest anthropogenic sources of cadmium at levels that, for the most part, are not above SLs.
Calcium		602	1,204	17,900	8,359	16,717	130,000	119	99	23,000	250,000	0	110	46	Nutrient, no soil SL. Concentrations are higher than background although the OU-1/OU-2 maximum is within a factor of 2 of the background maximum.
Chromium		19	38	134	24.6	49.1	1100	194	99	120	14,000	0	42	29	Chromium SLs vary widely depending on valence state and are not used here for comparison with total chromium. The OU-/OU-2 average chromium concentration is driven by two elevated points of 14,000 and 850 mg/kg. If these two high points are removed, the average would be 39 mg/kg and the maximum would be 550 mg/kg, consistent with OU-1/OU-2 background. As shown on Figure G-17, the source for chromium is not OU-3.

Table G-11. OU-1/OU-2 Chemical of Potential Concern Evaluation: Soil Metals
Anniston PCB Site, Anniston, Alabama

		FI	M Backgro	ound (mg/kg)	OU-1/OU	-2 Backgro	ound (mg/kg)				OU-1/OU-2 Data	a			
Constituent	Screening Level (mg/kg)	Mean	2x Mean	Maximum	Mean	2x Mean	Maximum	Number of Samples	Detection Frequency (%)	Mean (detected) (mg/kg)	Maximum (mg/kg)	Number Above Screening Level (detected)	Number Above 2x Mean FM Background (detected)	Number Above 2x Mean OU- 1/OU-2 Background (detected)	Notes
Cobalt	23	8.1	16.3	96	17.1	34.2	390	119	76	11	150	8	12	3	Only 7% of the samples were above screening levels and fewer were above OU-1/OU-2 background. OU-1/OU-2 background is slightly higher than FM background, suggesting an anthropogenic source of cobalt to the area. OU-1/OU-2 concentrations are more typical of FM background and are lower than OU-1/OU-2 background, indicating that OU-3 is not the source of cobalt to the area.
Copper	3100	8.0	15.9	61	131	262	17000	127	98	94	1,820	0	108	5	None above SL.
Iron	55,000	19,623	39,247	56,300	22,756	45,512	160,000	119	100	30000	580,000	8	14	11	Although the means inside and outside of OU-1/OU-2 are similar, the OU-1/OU-2 maximum indicates elevated concentrations inside of the OU. Concentrations of iron in OU-1/OU-2 and in the surrounding area are attributable to multiple uses of iron in the area.
Lead	400	20	39	500	128	255	87,400	519	100	430	30,000	68	443	122	OU-1/OU-2 background and OU-1/OU-2 concentrations are significantly higher than FM background, indicating anthropogenic source(s) of lead to the area. The OU-1/OU-2 maximum is lower than the background OU-1/OU-2 maximum. These data are consistent with the multiple, known uses of lead in the area.
Magnesium		453	906	9,600	1,950	3,899	57,000	119	97	8,200	100,000	0	93	54	Nutrient, no soil SL. OU-1/OU-2 concentrations are higher than background although the OU-1/OU-2 maximum is within a factor of 2 of the background maximum.
Manganese		736	1,472	19,000	1,273	2,546	36,000	119	100	1,000	10,000	0	21	8	OU-1/OU-2 concentrations are consistent with background. The OU-1/OU-2 mean is comparable with mean background, and the OU-1/OU-2 maximum is significantly less than the OU-1/OU-2 and FM background maximums. Concentrations of manganese may be attributed to naturally occurring or anthropogenic background and do not appear to originate inside of OU-1/OU-2 or OU-3.
Mercury	5.6	0.04	0.07	0.32	0.41	0.83	28	210	78	0.42	7.5	2	135	16	Mercury was detected above the SL in only 1% of the samples. The maximum concentration is higher outside of OU-1/OU-2 than inside and the means are similar indicating sources of mercury outside of OU-1/OU-2 and OU-3.
Nickel	1,500	5.78	11.56	38	17.98	35.97	180	127	89	26	410	0	62	8	None above SL.

Table G-11. OU-1/OU-2 Chemical of Potential Concern Evaluation: Soil Metals Anniston PCB Site, Anniston, Alabama

		F	M Backgro	ound (mg/kg)	OU-1/OU	l-2 Backgro	ound (mg/kg)				OU-1/OU-2 Date	a			
Constituent	Screening Level (mg/kg)	Mean	2x Mean	Maximum	Mean	2x Mean	Maximum	Number of Samples	Detection Frequency (%)	Mean (detected) (mg/kg)	Maximum (mg/kg)	Number Above Screening Level (detected)	Number Above 2x Mean FM Background (detected)	Number Above 2x Mean OU- 1/OU-2 Background (detected)	Notes
Potassium		379	757	6,150	1,108	2,216	110,000	119	100	800	2,800	0	56	2	Nutrient, no soil SL. Consistent with background.
Selenium	390	0.24	0.48	1.3	1.53	3.07	13	194	24	1.9	26	0	46	3	None above SL.
Silver	390	0.15	0.30	1.9	1.3	2.6	15	194	25	9.8	360	0	33	8	None above SL.
Sodium		333	667	643	418	835	5,090	129	20	250	840	0	2	1	Nutrient, no soil SL. Consistent with background.
Thallium	5.1	1.22	2.45	34	8.28	16.6	81	127	50	5.5	30	33	42	3	OU-1/OU-2 and background means are higher than FM background, suggesting anthropogenic source(s) in the Anniston area. The OU-1/OU-2 mean is only slightly higher than OU-1/OU-2 background, and the max is lower than the OU-1/ OU-2 background max indicating that if concentrations are not completely attributable to natural sources, they are likely attributable to low level industrial background.
Vanadium	5.5	30.9	61.7	158	21.8	43.5	210	119	97	25	72	111	2	8	FM and OU-1/OU-2 background concentrations are higher than SLs. OU-1/OU-2 data are consistent with and generally lower than background values.  Concentrations appear to be typical of naturally occurring background.
Zinc	23,000	18.9	37.9	209	624	1,249	11,000	127	100	400	3,000	0	123	10	None above the SL. The OU-1/OU-2 mean and overall distribution of zinc indicate that the concentrations are consistent with urban background and possibly other sources of zinc in the area.

--: not available or not applicable

%: percent FM: Fort McClellan

mg/kg: milligrams per kilogram

OU: operable unit

PAHs: polycyclic aromatic compounds SL: screening level

# Table G-12. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment Metals Anniston PCB Site, Anniston, Alabama

		FM Ba	ackground	(ma/ka)	OU-1/O	U-2 Backgr	ound (mg/kg)				OU-1/	OU-2 Data			
Constituent	Screening Level (mg/kg)	Mean	2x Mean			2x Mean	Maximum	Number of Samples	Detection Frequency (%)	Mean (detected) (mg/kg)	Maximum (mg/kg)	Number Above	Number Above 2x Mean FM Background (detected)	Number Above 2x Mean OU-1/OU-2 Background (detected)	Notes
Aluminum		4,296	8,593	17,400	4,429	8,857	8,500	11	100	3,700	6,000	NSL	0	0	No sediment SL. None were reported above 2x mean background. Concentrations appear to be attributable to naturally occurring background.
Antimony	12	0.36	0.72	1.2	8.0	16.0	22	11	55	1.3	2.9	0	5	0	None above SL.
Arsenic	7.24	5.67	11.3	20	12.5	25.1	71	17	100	10	21	11	7	0	Concentrations in OU-1/OU-2 are consistent with naturally occurring (FM) background and are lower than OU-1/OU-2 background. Although 7 samples were above 2x the mean FM background of 11 mg/kg, the OU-1/OU-2 maximum of 21 mg/kg is consistent with the FM background max of 20 mg/kg and significantly lower than the OU-1/OU-2 background maximum of 71 mg/kg. None were reported above the 2x mean OU-1/OU-2 background. Arsenic may be present in OU-1/OU-2 sediments from naturally occurring or anthropogenic sources.
Barium		49.5	98.9	272	98.9	198	350	17	100	180	580	NSL	10	4	No sediment SL. Concentrations in sediment are higher than FM or OU-1/OU2 background, but significantly less than the human health soil SL of 15,000 mg/kg and less than soil background. Relatively low concentrations of barium in sediment appears to be from naturally occurring or anthropogenic sources inside and outside of OU-1/OU-2.
Beryllium		0.49	0.98	1.20	0.82	1.64	1.9	17	88	1.7	4.2	NSL	9	5	No sediment SL. Although above background, concentrations are low (max = 4.2 mg/kg) and significantly less than the human health soil SL of 160 mg/kg. Although the OU-1/OU-2 max is slightly higher than FM or OU-1/OU-2 background, neither the concentrations nor distribution suggest a significant source of beryllium.
Cadmium	1.0	0.22	0.44	2.40	1.95	3.90	8.2	17	76	0.91	4.6	2	7	1	Only two samples were higher than the SL of 1 mg/kg with a maximum concentration of 4.6 mg/kg and only one sample was above 2x mean OU-1/OU-2 background. Sediment samples collected from upstream of OU-1/OU-2 are a little higher (max = 8 mg/kg) than those collected from OU-1/OU-2 (Figure G-15). As noted for soils, it appears anthropogenic source(s) of cadmium may be present in the Anniston area (max soil background = 94 mg/kg) and these may be contributing relatively low levels of cadmium to OU-1/OU-2 sediments.

# Table G-12. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment Metals Anniston PCB Site, Anniston, Alabama

		FM Ba	ckground	(ma/ka)	OU-1/O	U-2 Backgr	ound (mg/kg)				OU-1/	OU-2 Data			
Constituent	Screening Level (mg/kg)	Mean	2x Mean	Maximum		2x Mean	Maximum	Number of Samples	Detection Frequency (%)	Mean (detected) (mg/kg)	Maximum (mg/kg)	Number Above	Number Above 2x Mean FM Background (detected)	Number Above 2x Mean OU-1/OU-2 Background (detected)	Notes
Calcium		556	1,112	2,810	10,637	21,274	34,000	11	100	19,000	73,000	NSL	11	3	Nutrient, no sediment SL. Although above background, concentrations are less than in OU-1/OU-2 soils and appear to be generally consistent with area concentrations.
Chromium	52	15.6	31	63	119	238	1,000	17	100	130	670	11	14	3	OU-1/OU-2 background is higher than FM background, and the OU-1/OU-2 maximum concentrations are less than OU-1/OU-2 background. As noted for soils, elevated concentrations of chromium appear to be from one or more anthropogenic sources in the Anniston area and chromium does not appear to be attributable to OU-3.
Cobalt	50	5.51	11.0	22	11.5	23.0	50	17	94	26	110	2	12	6	Only two above SL of 50 mg/kg with a max of 110 mg/kg. Sediment concentrations appear to be consistent with soil concentrations inside and outside of OU-1/OU-2.
Copper	19	8.56	17.1	59	139	278	1300	11	100	50	230	10	10	0	None were reported above 2x mean OU-1/OU-2 background. Concentrations upstream in Snow Creek and in soils from outside of OU-1/OU-2 indicate source(s) of copper that are not OU-3 related. The highest concentration in OU-1/OU-2 sediment of 230 mg/kg is significantly less than the highest upstream concentration of 1,300 mg/kg and the OU-1/OU-2 soil maximum background concentration of 17,000 mg/kg.
Iron	20,000	17,633	35,267	57,500	14,594	29,189	37,000	11	100	35,000	100,000	7	3	4	Concentrations of iron in sediment are lower than in OU-1/OU-2 soils and appear to be the result of multiple historical and current uses of iron in the area.
Lead	30	18.9	37.8	110	172	345	1,200	24	100	72	510	16	13	1	Only one sediment sample with a concentration of 510 mg/kg was higher than the residential soil cleanup goal of 400 mg/kg and above 2x mean OU-1/OU-2 background. Concentrations in sediment are low relative to OU-1/OU-2 concentrations in soil and are consistent with the multiple known uses of lead in the area.
Magnesium		453	906	3,270	5,663	11,327	20,000	11	100	10,000	37,000	NSL	11	4	Nutrient, no sediment SL. Although sediment concentrations are above background, they are significantly less than soil concentrations.

# Table G-12. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment Metals Anniston PCB Site, Anniston, Alabama

		FM Ba	ackground	(mg/kg)	OU-1/O	U-2 Backgı	round (mg/kg)				OU-1/	OU-2 Data			
Constituent	Screening Level (mg/kg)	Mean	2x Mean	Maximum	Mean	2x Mean	Maximum	Number of Samples	Detection Frequency (%)	Mean (detected) (mg/kg)	Maximum (mg/kg)	Number Above Screening Level (detected)	Number Above 2x Mean FM Background (detected)	Number Above 2x Mean OU-1/OU-2 Background (detected)	Notes
Manganese	460	356	712	2,050	951	1,902	7,500	17	100	1,800	5,200	16	14	7	OU-1/OU-2 background was higher than FM background indicating upstream sources of manganese. OU-1/OU-2 concentrations are generally consistent with OU-1/OU-2 sediment background and a little lower than OU-1/OU-2 soil background. Concentrations may be attributable to local anthropogenic sources, but do not appear to originate in OU-3.
Mercury	0.13	0.06	0.12	0.28	0.18	0.36	0.96	17	88	1.1	8.6	11	11	6	The maximum concentration of mercury in sediment (8.6 mg/kg) is lower than the OU-1/OU-2 soil background maximum of 28 mg/kg. The concentrations in sediment are likely the result of runoff from several local sources throughout the Anniston area. The sediment mean concentration (1.1 mg/kg) is slightly higher than the soil mean (0.4 mg/kg), likely because sediment samples were collected in depositional areas (i.e., higher concentration areas) of Snow Creek.
Nickel	16	6.51	13.0	33	32.1	64.3	270	17	100	35	110	12	12	3	Mean and maximum inside and outside of OU- 1/OU-2 are consistent with each other and consistent with the multiple industrial uses of heavy metals in the area.
Potassium		507	1,013	4,810	289	578	440	11	100	370	660	NSL	0	1	Nutrient, no sediment SL. Consistent with background.
Selenium	2.0	0.36	0.72	1.9	1.2	2.4	1.2	11	64	1.3	3.4	2	5	1	FM, OU-1/OU-2 and OU-1/OU-2 background concentrations are similar, indicating that concentrations are attributable to naturally occurring background. Max of 3.4 mg/kg is only slightly above the SL of 2 mg/kg and the 2x mean OU-1/OU-2 background of 2.4 mg/kg.

Table G-12. OU-1/OU-2 Chemical of Potential Concern Evaluation: Sediment Metals Anniston PCB Site, Anniston, Alabama

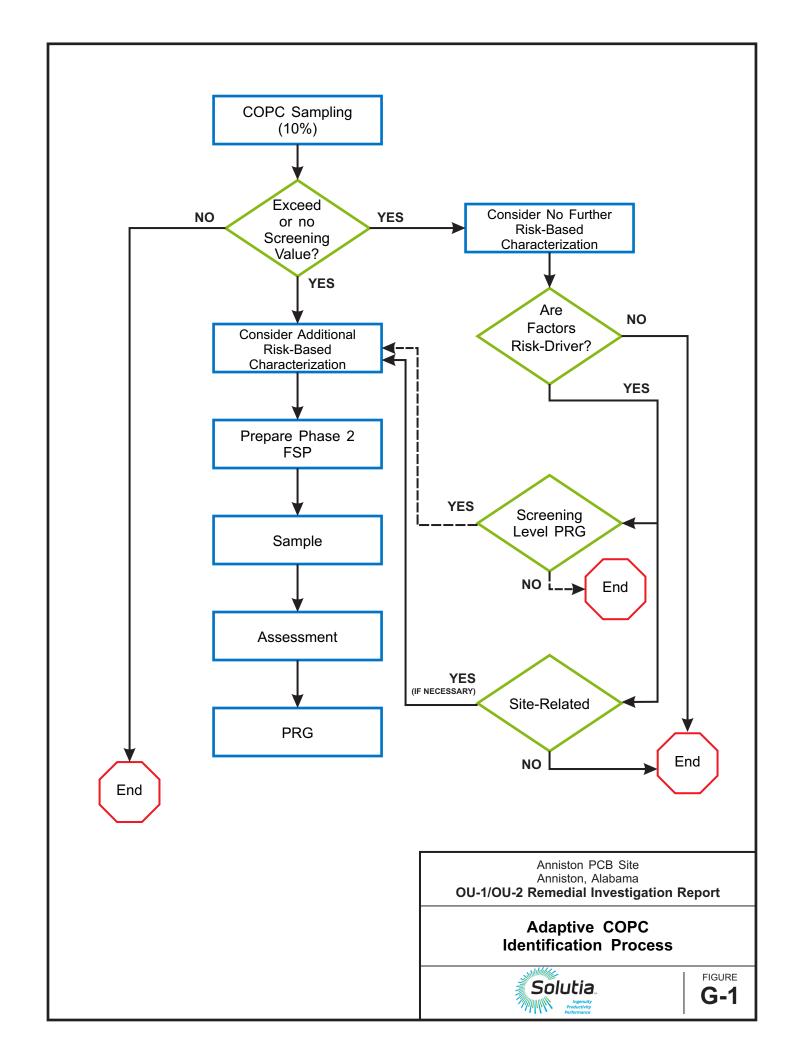
		FM Ba	ackground	(mg/kg)	OU-1/0	U-2 Backgr	round (mg/kg)				OU-1/	OU-2 Data			
Constituent	Screening Level (mg/kg)	Mean	2x Mean	Maximum	Mean	2x Mean	Maximum	Number of Samples	Detection Frequency (%)	Mean (detected) (mg/kg)	Maximum (mg/kg)	Number Above Screening Level (detected)	Number Above 2x Mean FM Background (detected)	Number Above 2x Mean OU-1/OU-2 Background (detected)	Notes
Silver	2.0	0.16	0.32	1.1	2.47	4.93	4.8	11	18	0.66	0.71	0	2	0	None above SL.
Sodium		346	692	738				11	0						Nutrient, no sediment SL. Sodium was not detected in OU-1/OU-2 sediment samples.
Thallium		0.06	0.12	0.22	2.47	4.93	4.3	11	82	12	50	NSL	9	5	No sediment SL. Concentrations in OU-1/OU-2 sediment are higher than in background sediment and than in OU-1/OU-2 soils, but the max in sediment (50 mg/kg) is lower than in soils outside of OU-1/OU-2 (max = 82 mg/kg). Thallium concentrations in soil might be attributable to anthropogenic sources inside or outside of OU-1/OU-2.
Vanadium		20.4	40.9	67	29.8	59.5	59	17	100	31	64	NSL	6		No sediment SL. Concentrations are consistent with background and are probably naturally occurring.
Zinc	124	26.4	52.7	111	1,114	2,228	19,000	11	100	160	440	6	11	0	Mean OU-1/OU-2 background is higher than FM background, indicating anthropogenic source(s) consistent with other known uses of heavy metals in the area. No OU-1/OU-2 samples were detected above 2x mean OU-1/OU-2 background indicating concentrations are consistent with local, anthropogenic background.

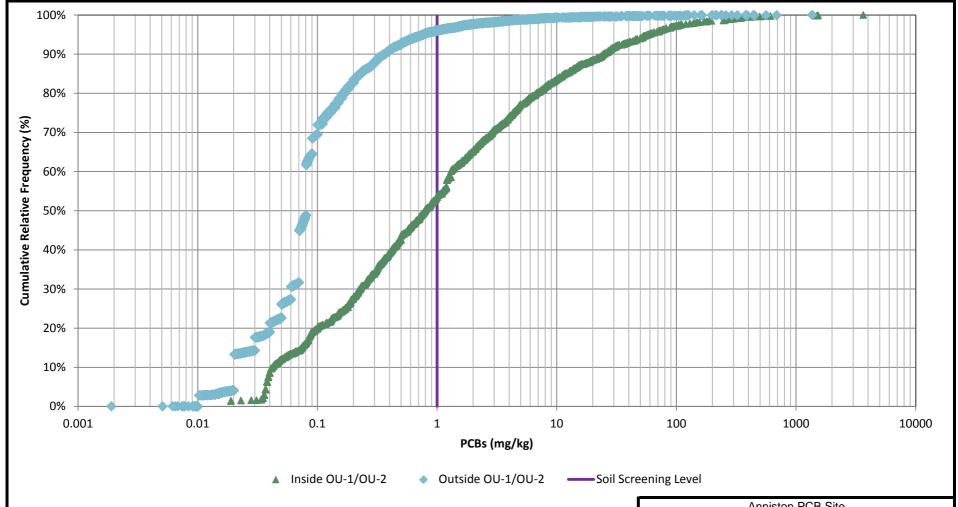
--: not available or not applicable

%: percent FM: Fort McClellan

mg/kg: milligrams per kilogram
OU: operable unit
PAHs: polycyclic aromatic compounds
SL: screening level

### **Figures**





mg/kg: milligrams per kilogram

OU: operable unit

PCBs: polychlorinated biphenyls

%: percent

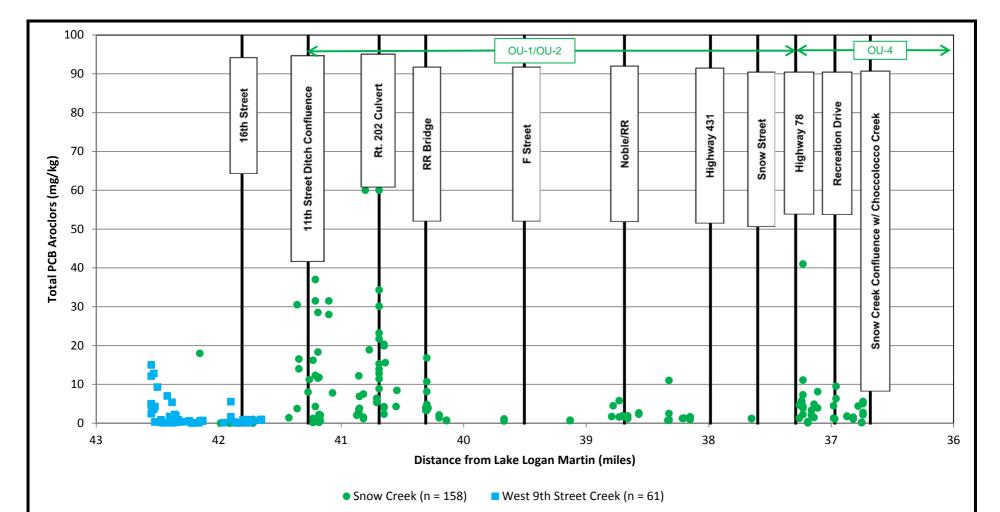
Anniston PCB Site Anniston, Alabama

**OU-1/OU-2** Remedial Investigation Report

Frequency Distribution of PCB in Soil



**FIGURE** 



1. Data include results from Snow Creek OU-1/OU-2 (n = 96), Snow Creek upstream of 11th Street (n = 23), and OU-4 (n = 39).

2. Data include West 9th Street Creek Sediment Data (n = 61).

- 3. For total PCB Aroclor calculation, nondetects were given a value of zero; if all PCB Aroclors were nondetect, then the maximum individual reporting limit was utilized.
- 4. mg/kg: milligrams per kilogram

n: sample count

OU: operable unit

PCBs: polychlorinated biphenyls

RR: railroad

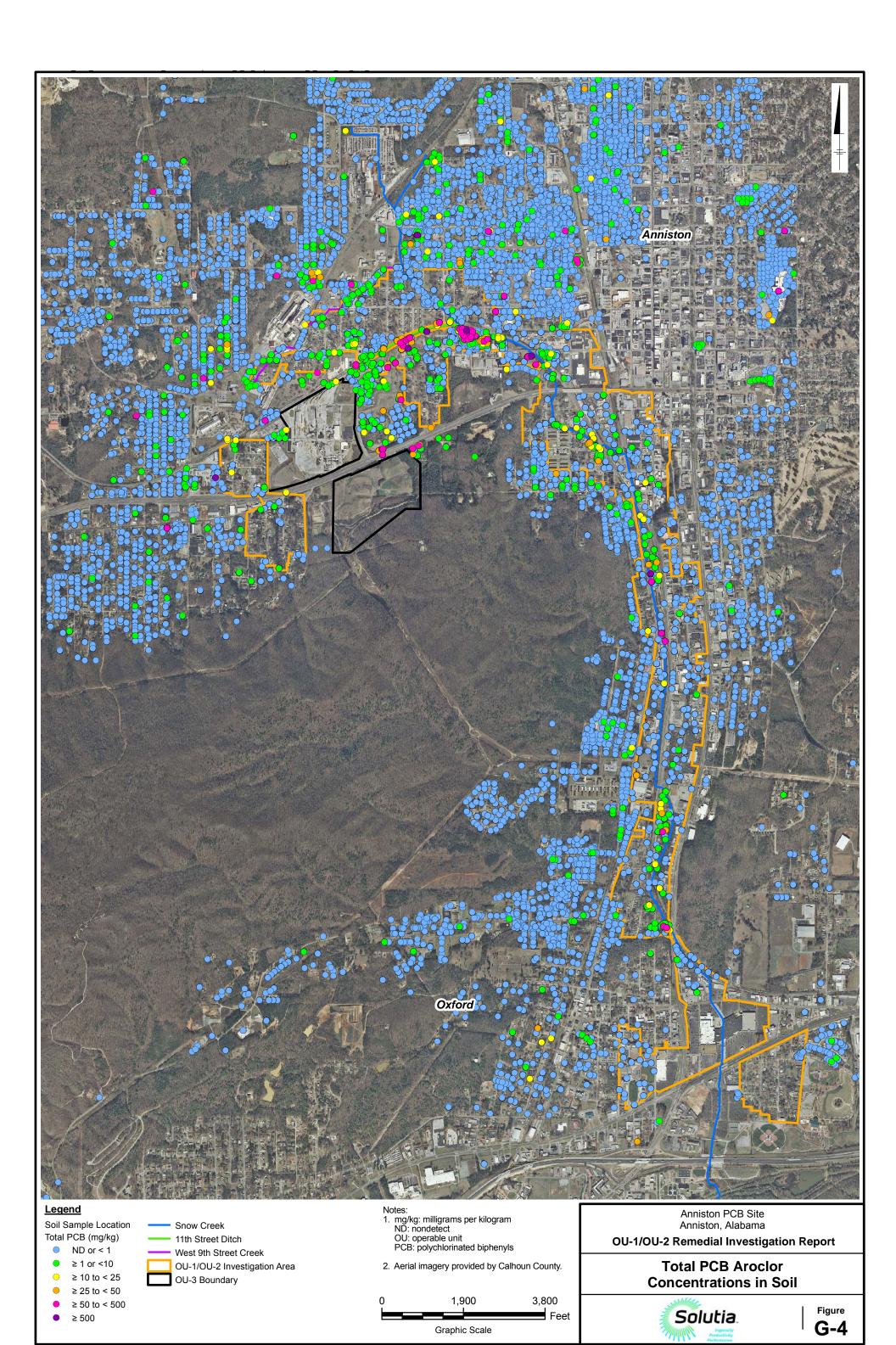
Anniston PCB Site Anniston, Alabama

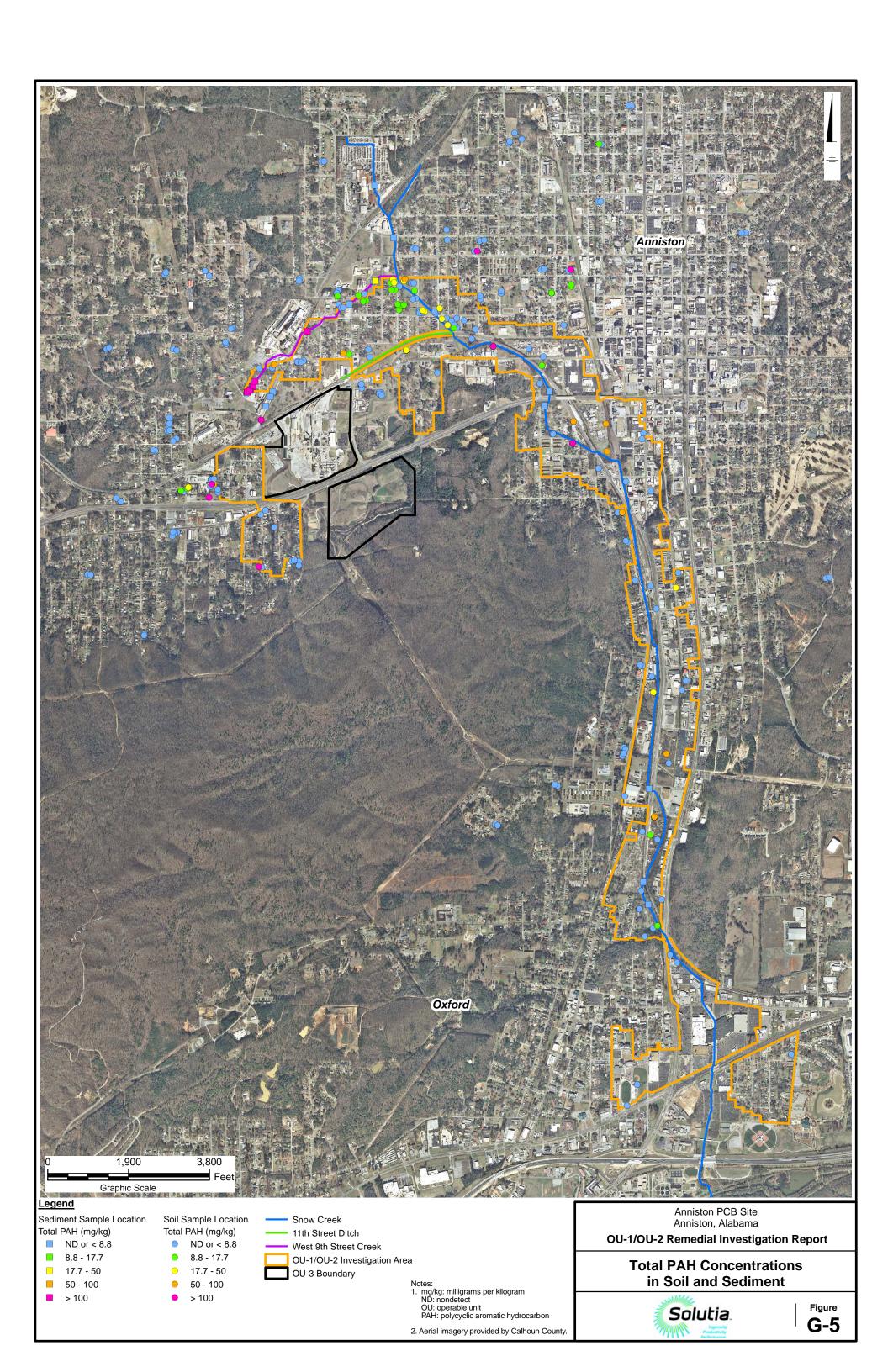
**OU-1/OU-2 Remedial Investigation Report** 

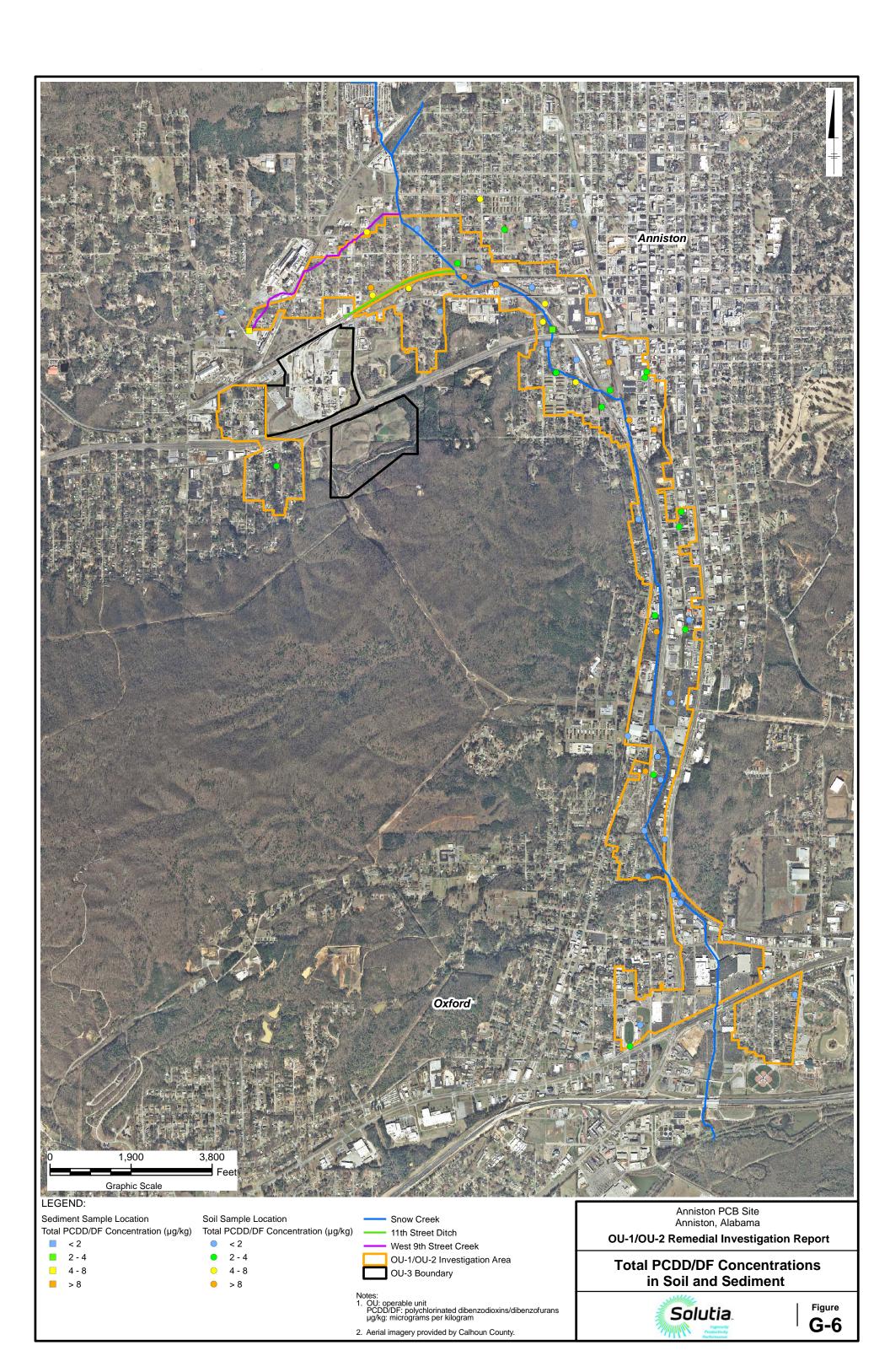
Total PCB Concentrations in Snow Creek Sediment with Distance from Lake Logan Martin

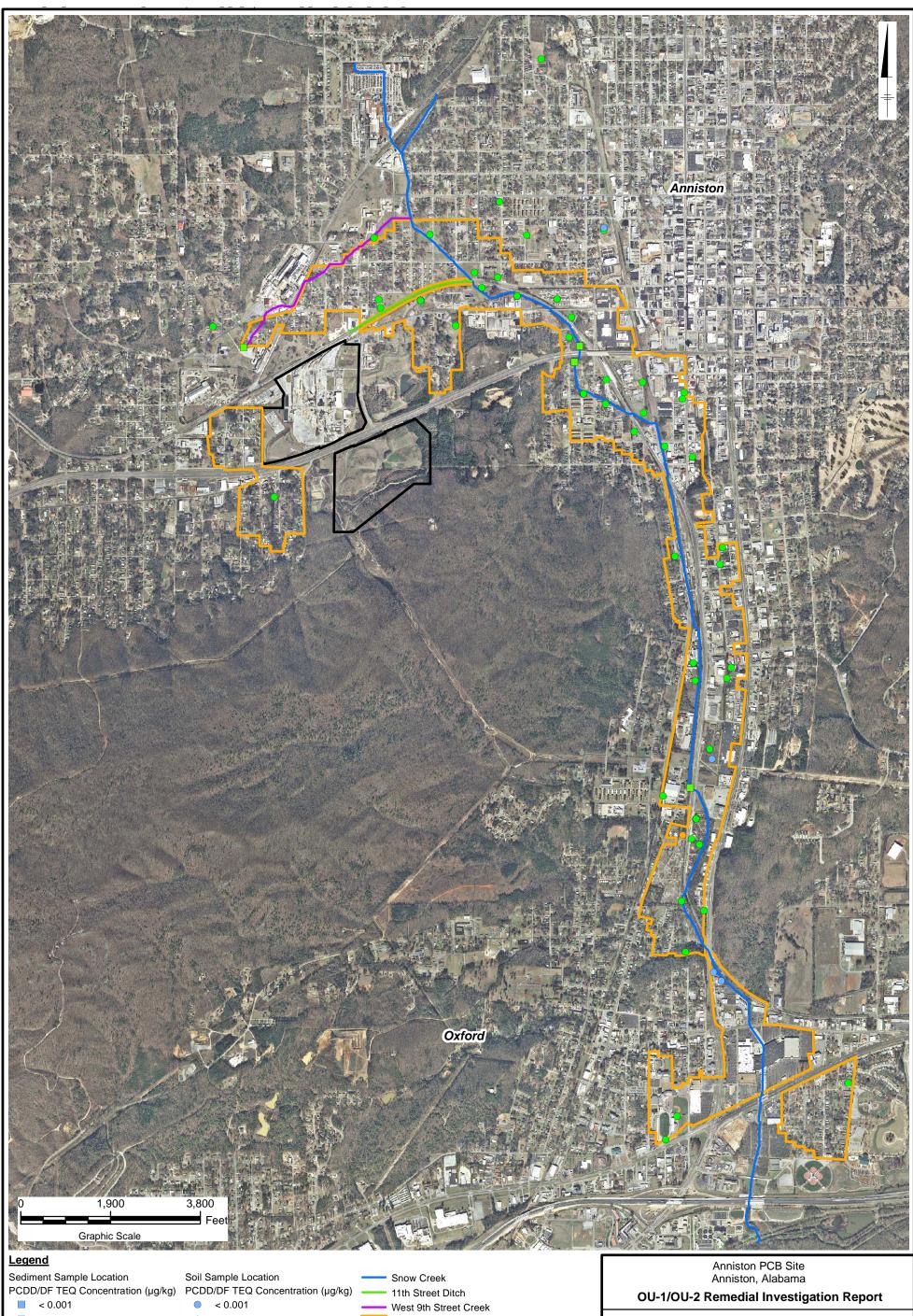


**FIGURE** 









0.001 - 0.25

0.25 - 2 > 2

0.001 - 0.25

0.25 - 2 >2

OU-1/OU-2 Investigation Area

OU-3 Boundary

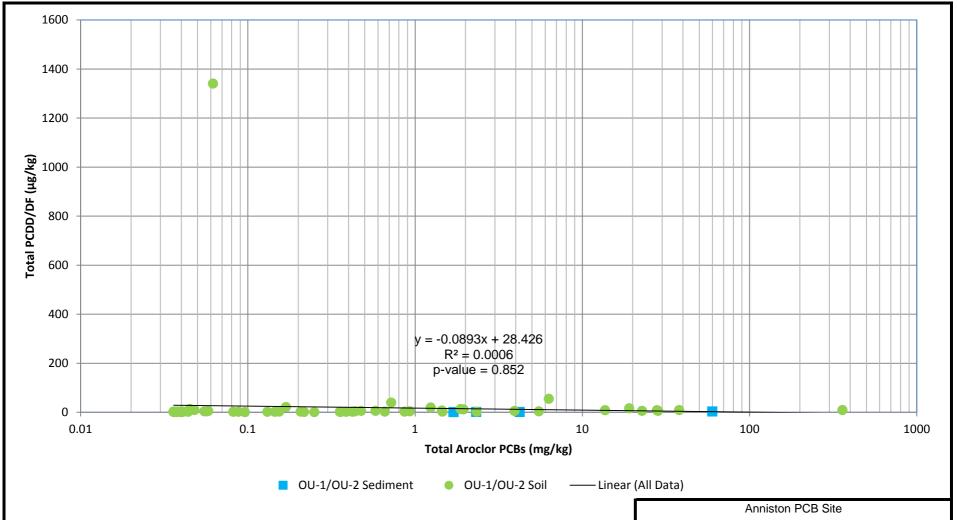
Notes:
1. OU: operable unit
PCDD/DF: polychlorinated dibenzodioxins/dibenzofurans
TEQ: toxic equivalency
µg/kg: micrograms per kilogram

2. Aerial imagery provided by Calhoun County.

**PCDD/DF TEQ Concentrations** in Soil and Sediment



Figure **G-7** 



mg/kg: milligrams per kilogram

OU: operable unit

PCDD/DF: polychlorodibenzodioxins/dibenzofurans

PCBs: polychlorinated biphenyls µg/kg: micrograms per kilogram

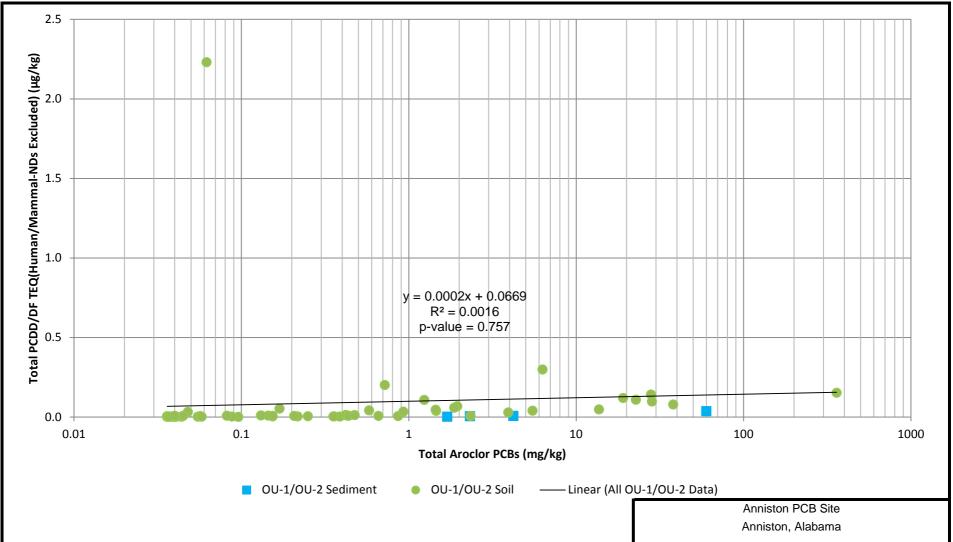
Anniston, Alabama

**OU-1/OU-2 Remedial Investigation Report** 

PCDD/DF Concentrations as a Function of Total PCB Concentrations



**FIGURE** 



mg/kg: milligrams per kilogram

ND: nondetect OU: operable unit

PCDD/DF: polychlorodibenzodioxins/dibenzofurans

PCBs: polychlorinated biphenyls

TEQ: toxic equivalent

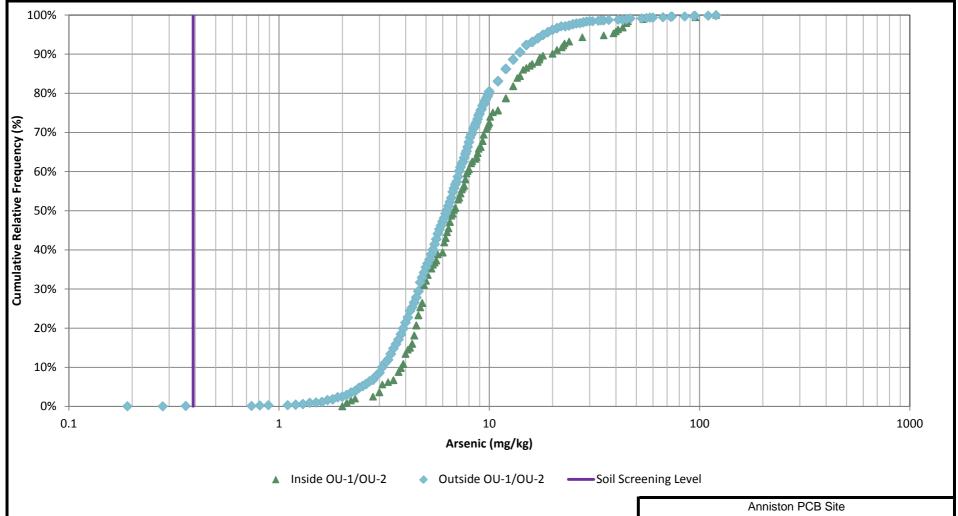
μg/kg: micrograms per kilogram

**OU-1/OU-2** Remedial Investigation Report

PCDD/DF TEQ Concentrations as a Function of Total PCB Concentrations



FIGURE



mg/kg: milligrams per kilogram

OU: operable unit

%: percent

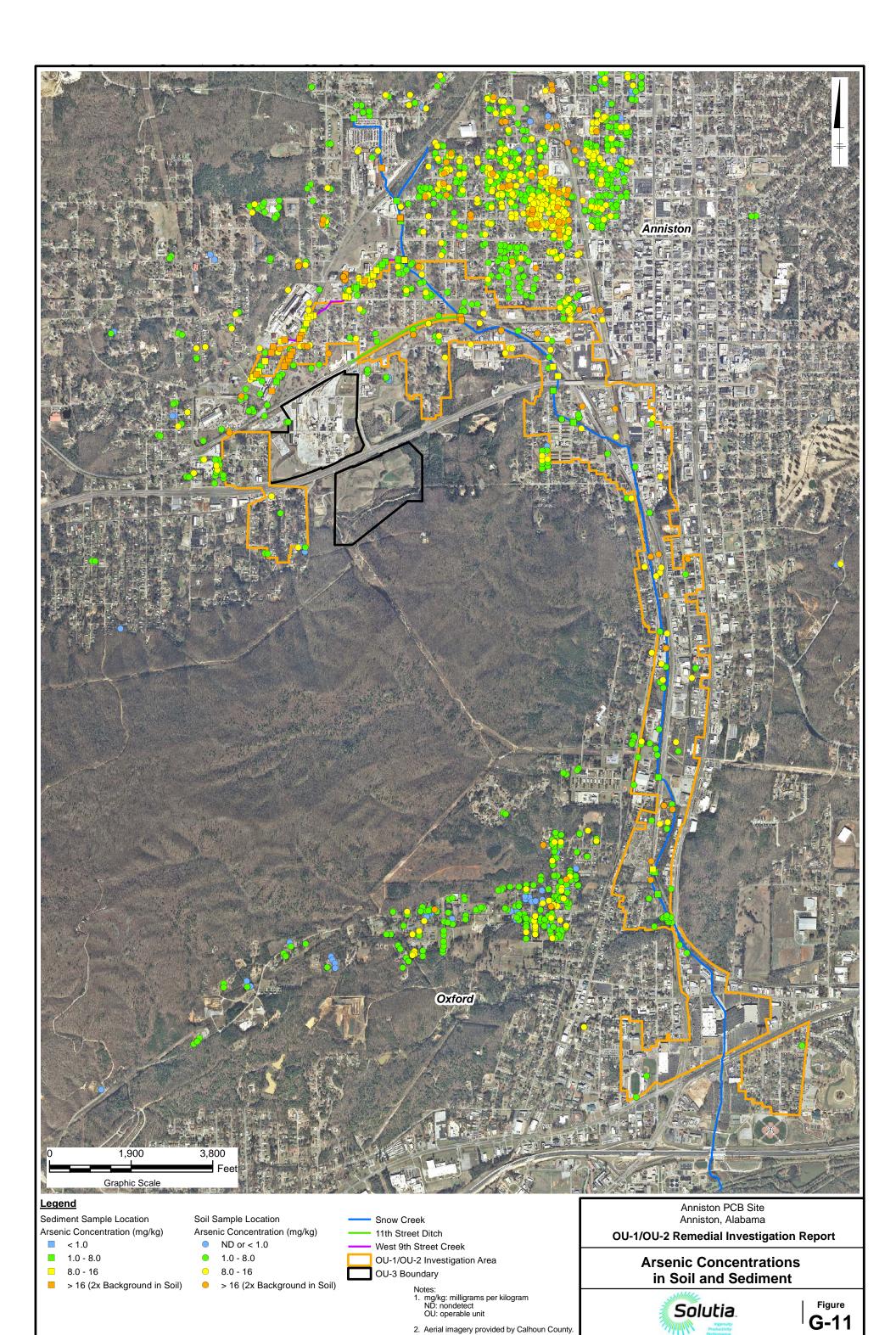
Anniston, Alabama

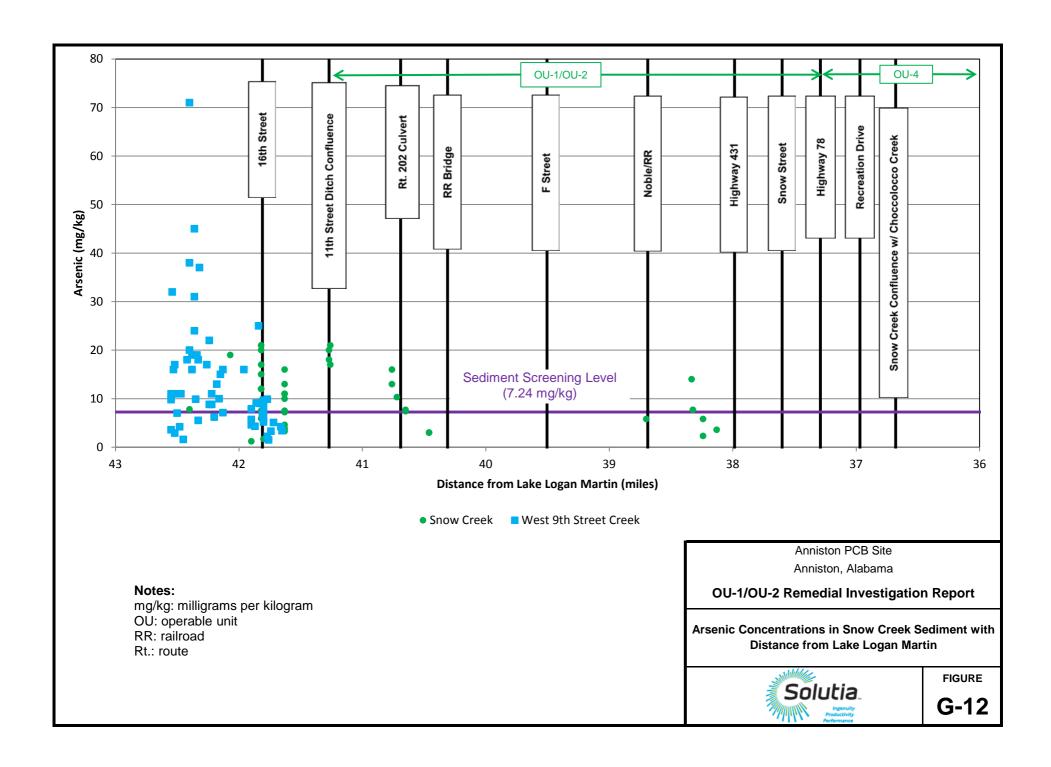
**OU-1/OU-2** Remedial Investigation Report

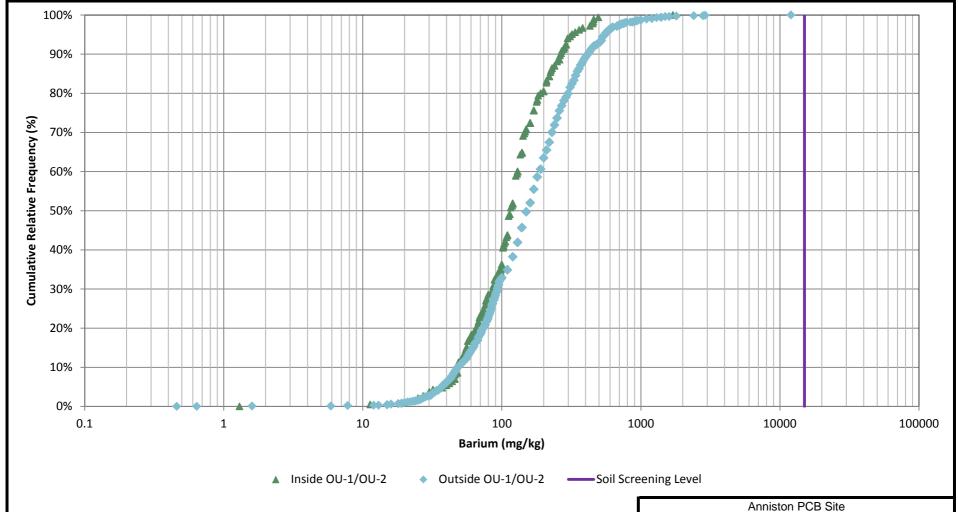
Frequency Distribution of Arsenic in Soil



**FIGURE** 







mg/kg: milligrams per kilogram

OU: operable unit

%: percent

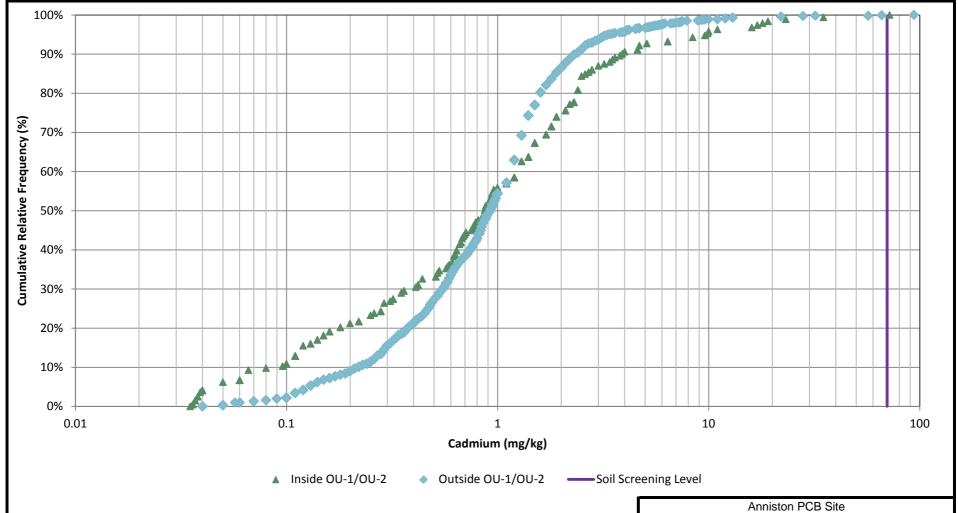
Anniston PCB Site Anniston, Alabama

OU-1/OU-2 Remedial Investigation Report

Frequency Distribution of Barium in Soil



FIGURE



mg/kg: milligrams per kilogram

OU: operable unit

%: percent

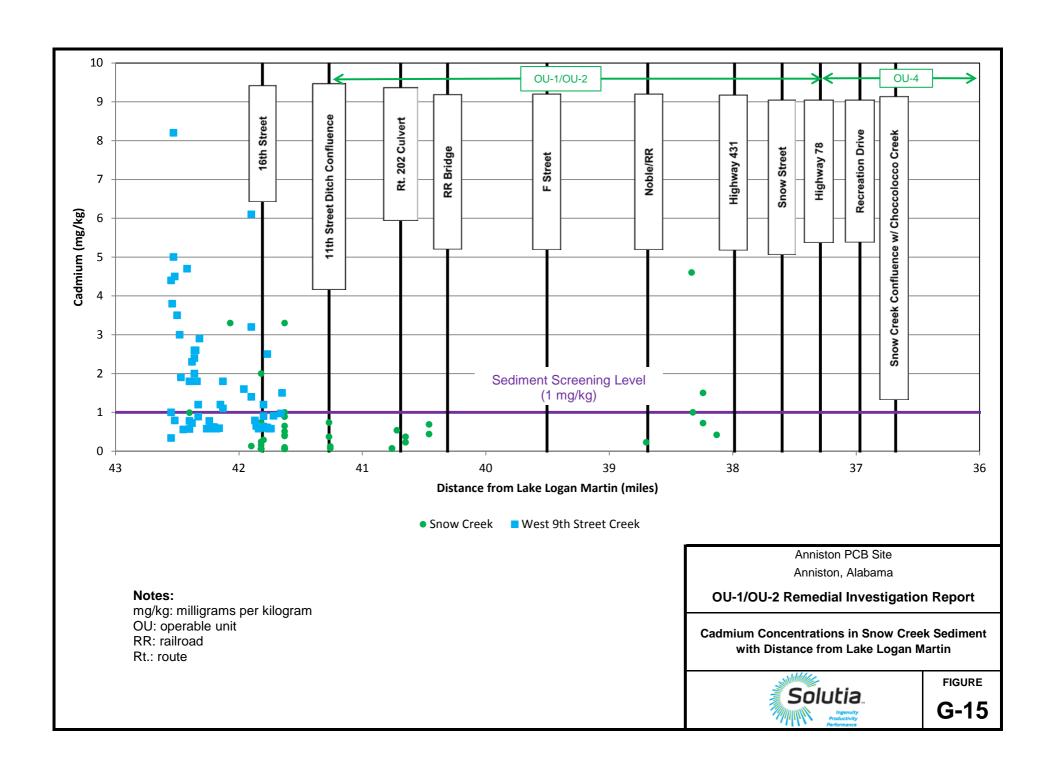
Anniston PCB Site Anniston, Alabama

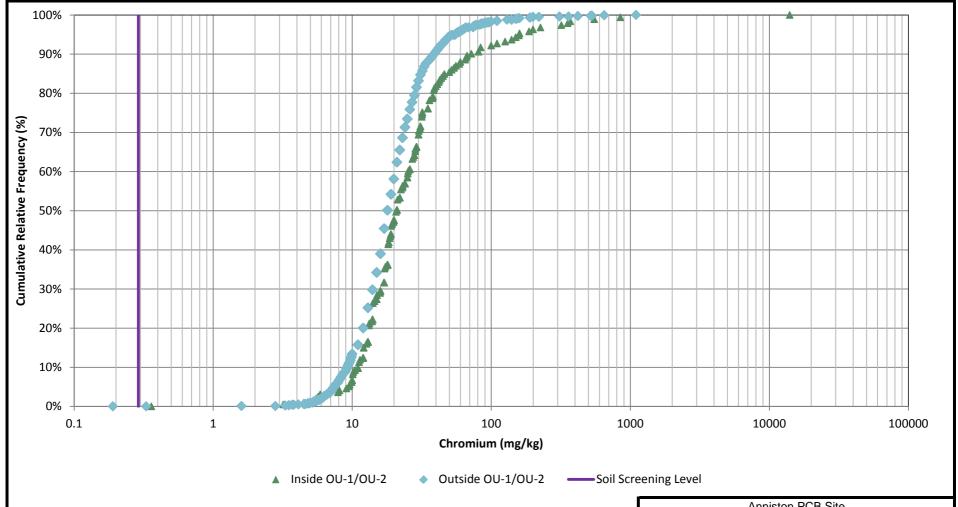
OU-1/OU-2 Remedial Investigation Report

Frequency Distribution of Cadmium in Soil



**FIGURE** 





mg/kg: milligrams per kilogram

OU: operable unit

%: percent

Anniston PCB Site Anniston, Alabama

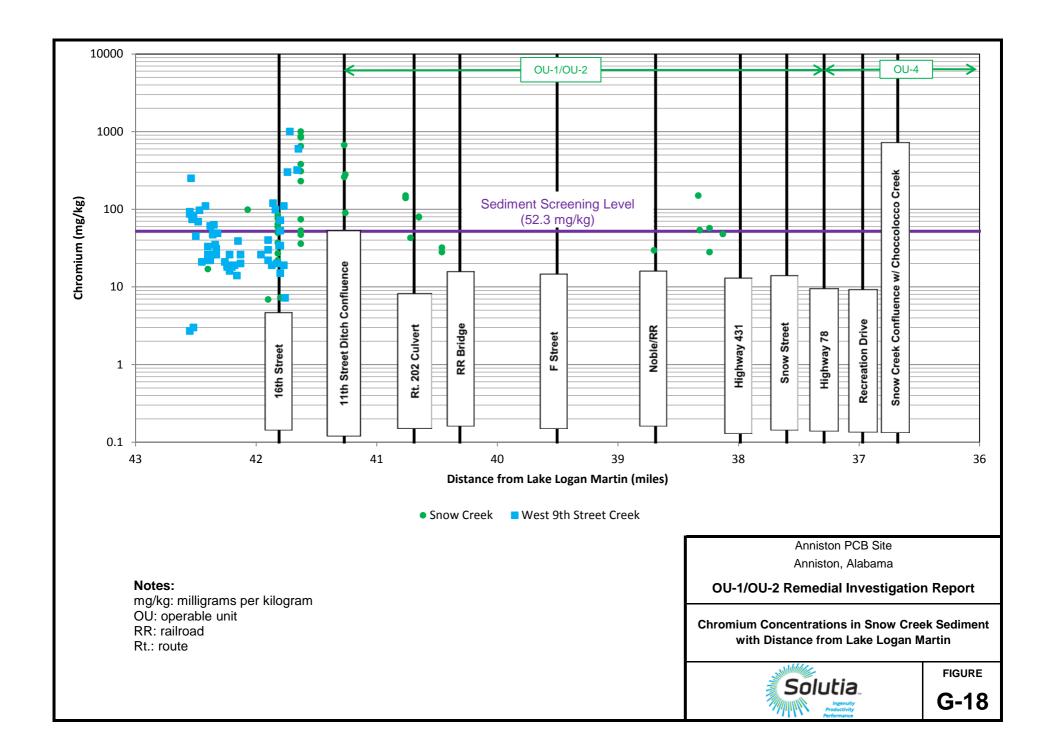
OU-1/OU-2 Remedial Investigation Report

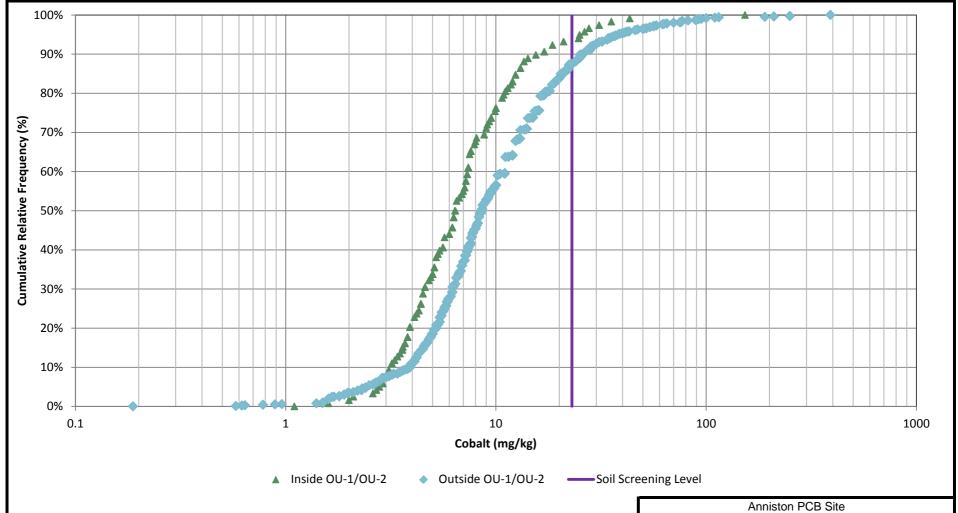
Frequency Distribution of Chromium in Soil



**FIGURE** 







mg/kg: milligrams per kilogram

OU: operable unit

%: percent

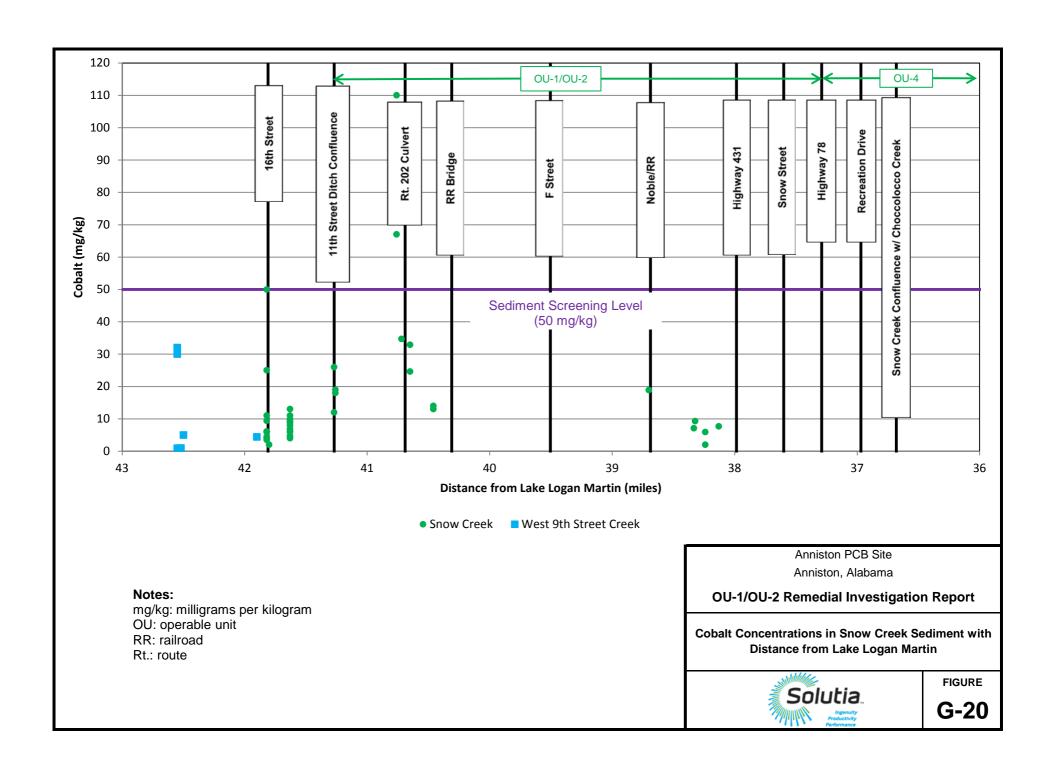
Anniston PCB Site Anniston, Alabama

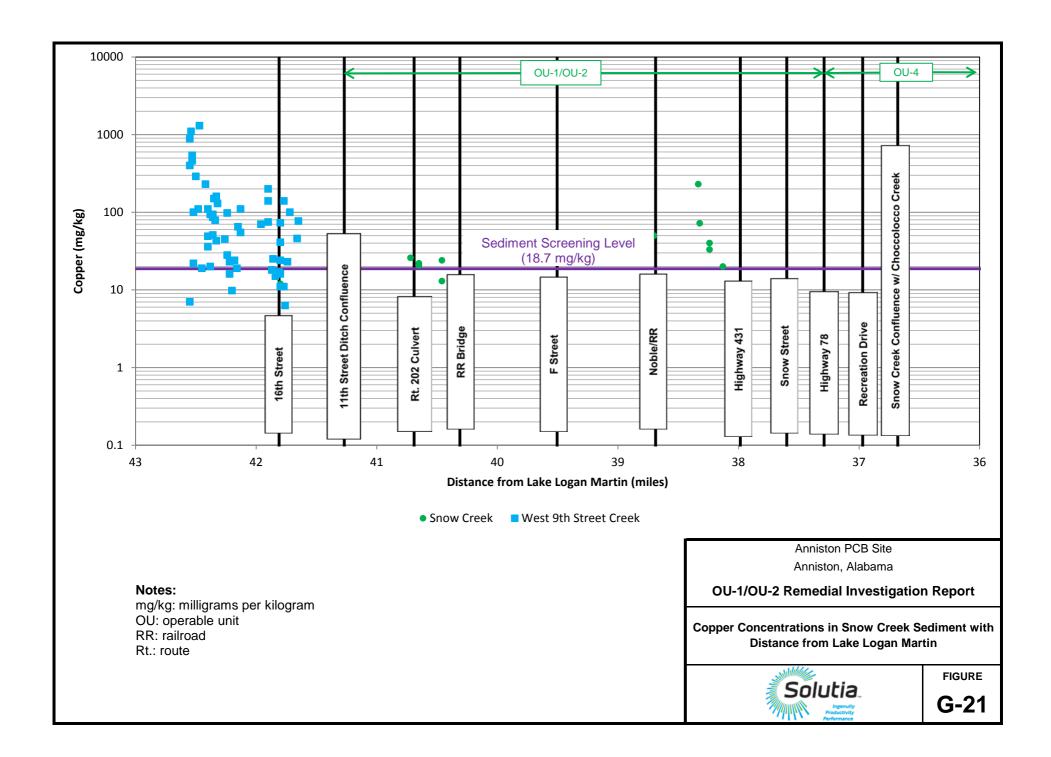
OU-1/OU-2 Remedial Investigation Report

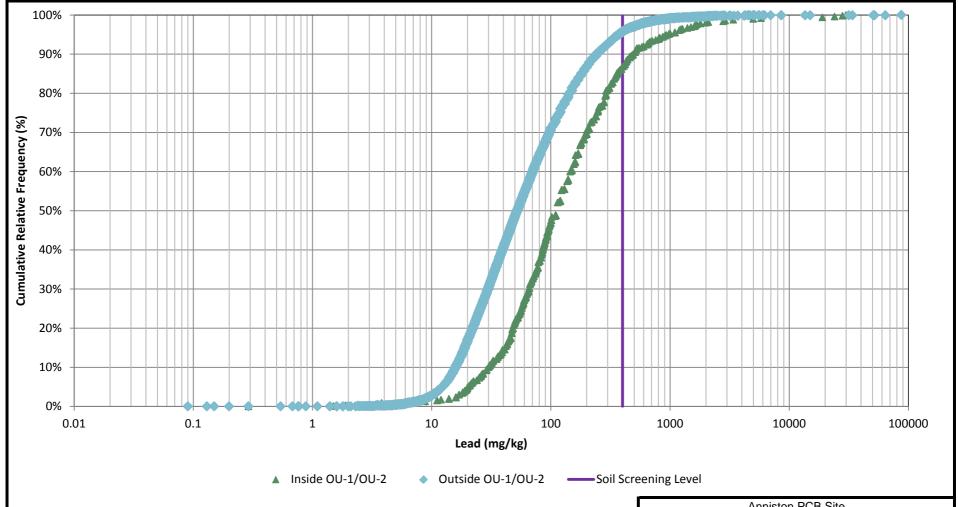
Frequency Distribution of Cobalt in Soil



**FIGURE** 







mg/kg: milligrams per kilogram

OU: operable unit

%: percent

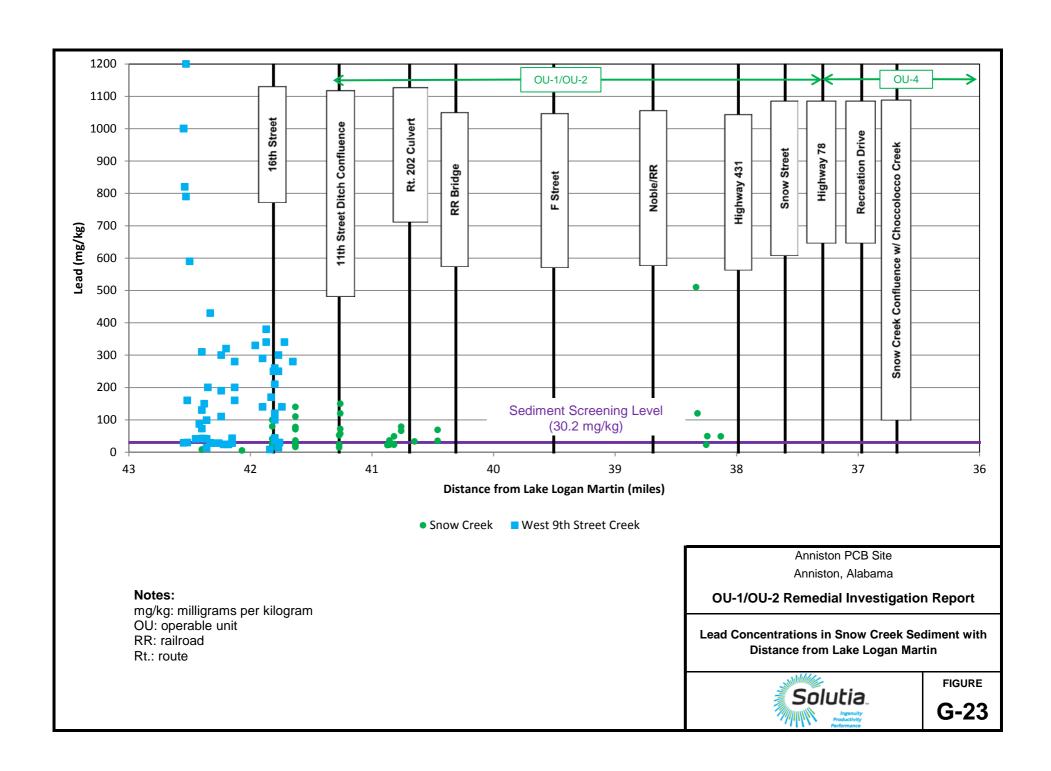
Anniston PCB Site Anniston, Alabama

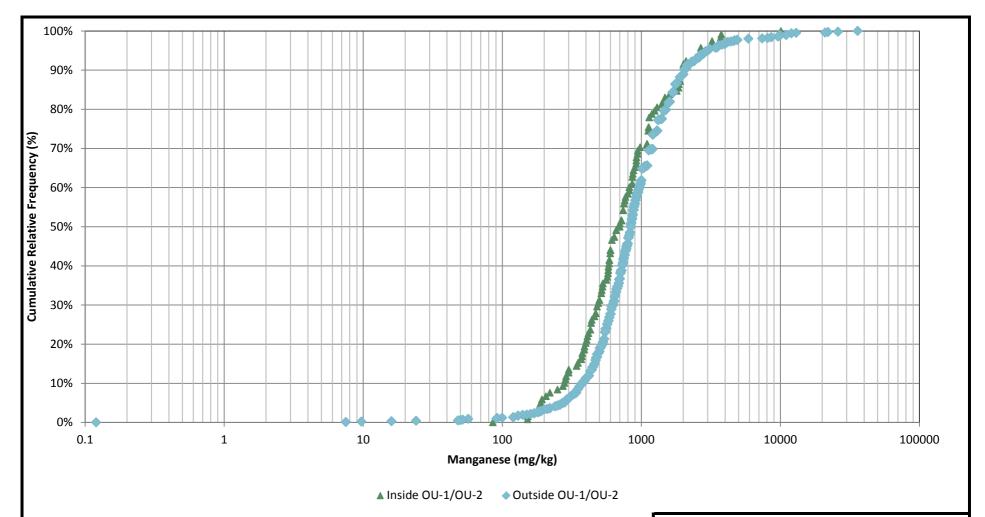
**OU-1/OU-2** Remedial Investigation Report

Frequency Distribution of Lead in Soil



**FIGURE** 





1. Screening value for OU-1/OU-2 is not available.

2. mg/kg: milligrams per kilogram

OU: operable unit

%: percent

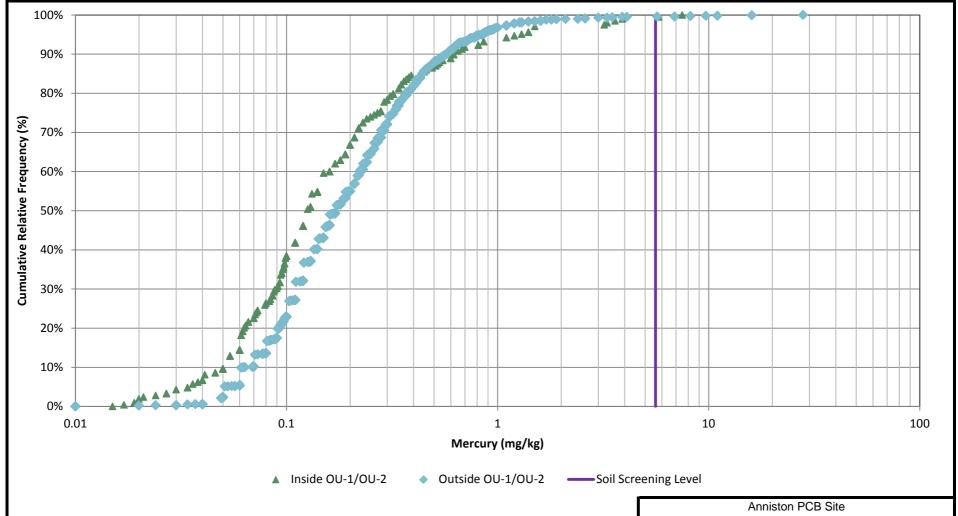
Anniston PCB Site Anniston, Alabama

OU-1/OU-2 Remedial Investigation Report

Frequency Distribution of Manganese in Soil



**FIGURE** 



mg/kg: milligrams per kilogram

OU: operable unit

%: percent

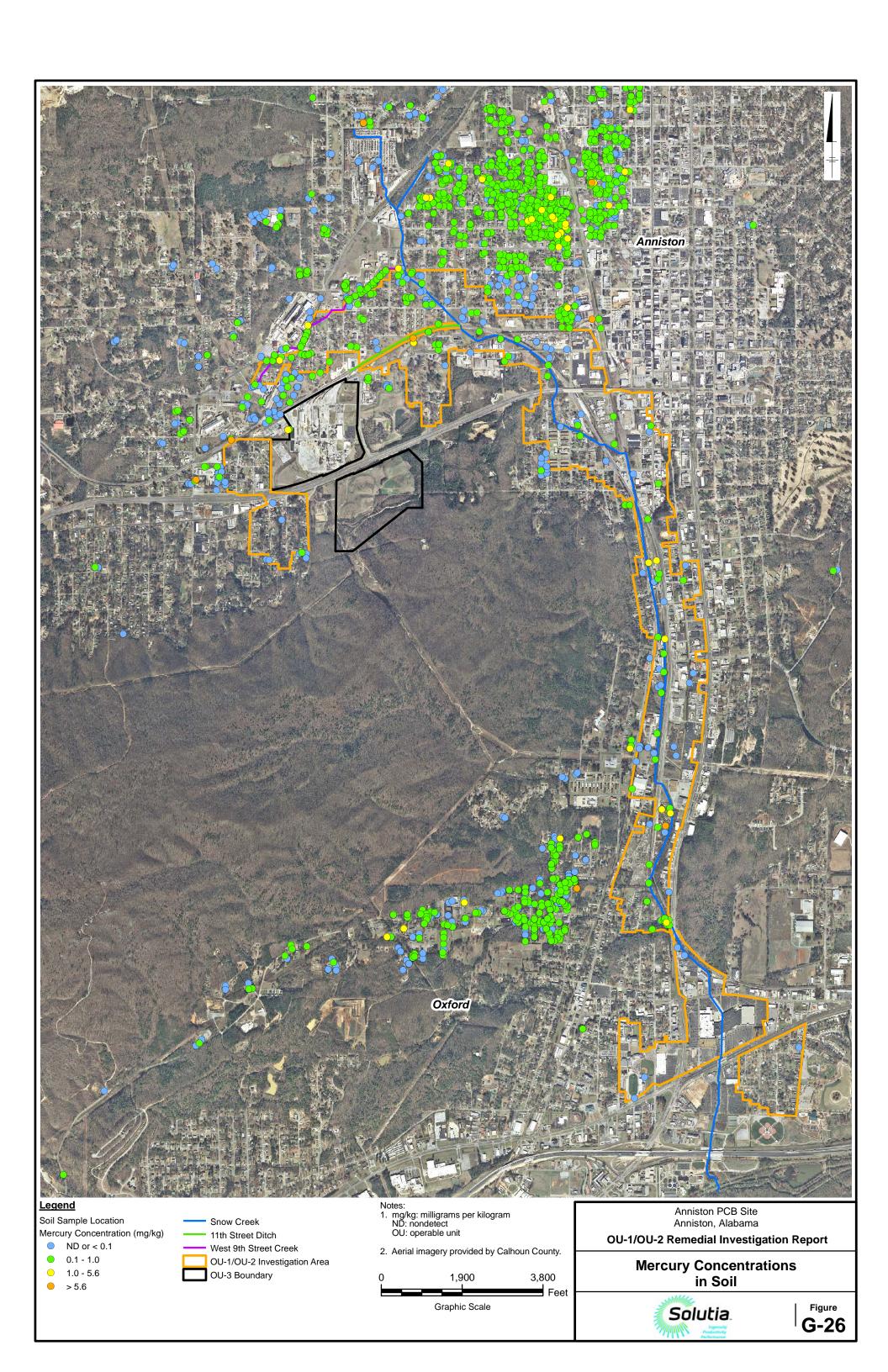
Anniston, Alabama

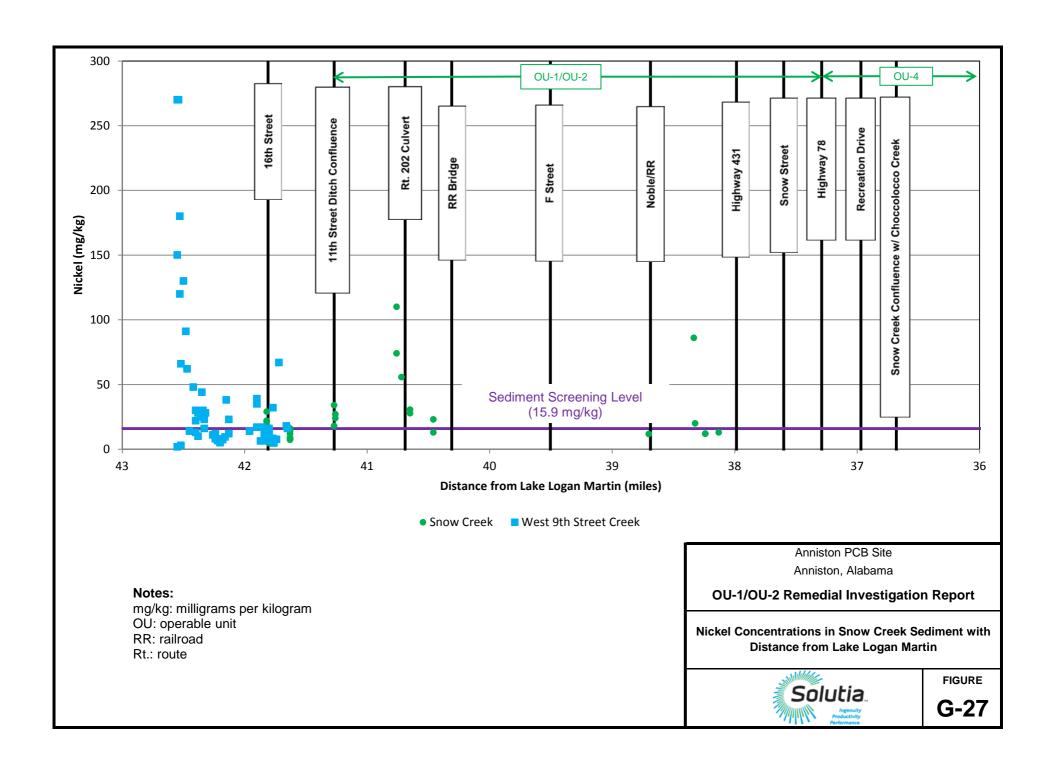
**OU-1/OU-2** Remedial Investigation Report

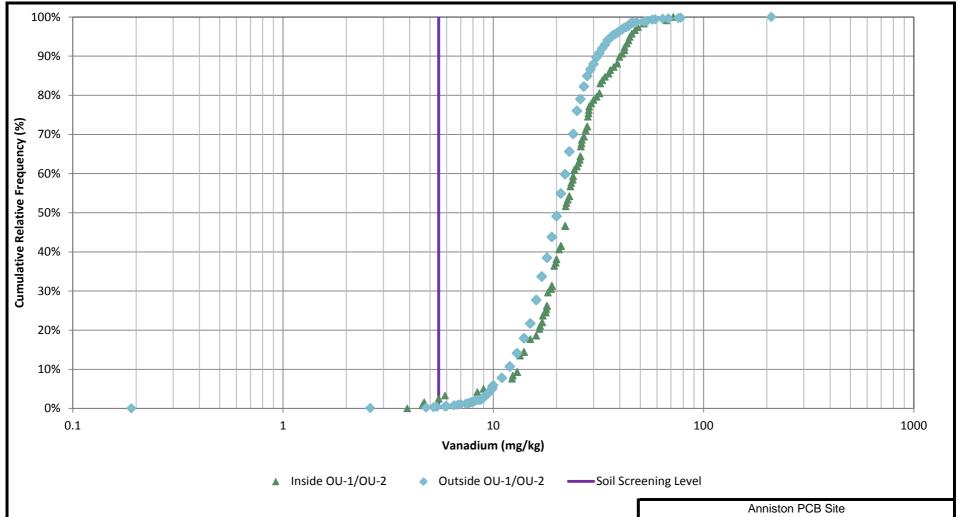
**Frequency Distribution of Mercury in** Soil



**FIGURE** 







mg/kg: milligrams per kilogram

OU: operable unit

%: percent

Anniston PCB Site Anniston, Alabama

OU-1/OU-2 Remedial Investigation Report

Frequency Distribution of Vanadium in Soil



**FIGURE** 

Pollutant (Outfall Number)	Detection Level Used	Maximum Daily Value	Maximum Daily Value	Average of Analyses	Average of Analyses	Number of Analyses	Units	Units
	2070/ 0000	Conc.	Mass	Conc.	Mass	1	Conc.	Mass
Acenaphthene	0.74 ppm				0.0028	2	<del></del> -	ppd
Acrolein								
Acrylonitrile								
Benzene	0.20	_			0.0057	2		ppd
Benzidine								
Carbon Tetrachloride	0.50				0.0012	2		ppd
Chlorobenzene	0.10				0.0002	2		ppd
1,2,4-Trichlorobenzene	0.55				0.0013	2		ppd
Hexachlorobenzene	0.80				0.0018	2		ppd
1,2-Dichloroethane	0.10				0.0012	2		ppd
1,1,1-Trichloroethane	0.12				0.003	2		ppd
Hexachloroethane	0.80				0.0018	2		ppd
1,1-Dichloroethane	0.50				0.0012	2		ppd
1,1,2-Trichloroethane	0.50				0.0012	2		ppd
1,1,2,2-Tetrachloroethane								
Chloroethane	0.36				0.0008	2		ppd
Bis(2-chloroethyl)ether								
2-Chloroethyl vinyl ether								
2-Chloronaphthalene								
2,4,6-Trichlorophenol								
Parachlorometa cresol								
Chloroform	0.14				0.0019	2		ppd
2-Chlorophenol						2		ppd
1,2-Dichlorobenzene	0.55				0.0013	2		ppd
1,3-Dichlorobenzene	0.65				0.0015	2		ppd
1,4-Dichlorobenzene	0.57				0.0014	2		ppd
3,3-Dichlorobenzidine								
1,1-Dichloroethylene	0.50				0.0012	2		ppd
1,2-Trans-dichloroethylene	0.20				0.0005	2		ppd
2,4-Dichlorophenol								
1,2-Dichloropropane	0.50				0.0012	2		ppd
1,2-Dichloropropylene					-			- FPG
1,3-Dichloropropylene	0.21				0.0005	2		ppd
2,4-Dimethylphenol								1''

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Pollutant	Detection Level Used	Maximum Daily Value	Maximum Daily Value	Average of Analyses	Average of Analyses	Number of Analyses	Units	Units
		Conc.	Mass	Conc.	Mass		Conc.	Mass
2,4-Dinitrotoluene								
2,6-Dinitrotoluene				, <u> </u>				
1,2-Diphenylhydrazine (as								
Azobenzene)								
Ethylbenzene	0.11				0.0083	2		ppd
Fluoranthene	0.70				0.0016	2		ppd
4-Chlorophenyl phenyl ether					. ==			
4-Bromophenyl phenyl ether								
Bis(2-chloroisopropyl)ether								
Bis(2-chloroethoxy) methane								
Methylene chloride	1.0				0.0023	2		bąq
Methyl chloride	1.0				0.0023	2		ppd
Methyl bromide								
Bromoform								
Dichlorobromomethane								
Chlorodibromomethane								
Hexachlorobutadiene	0.61				0.0014	2		ppd
Hexachlorocyclopentadiene								
Isophorone								
Naphthalene	0.69				0.0016	2		ppd
Nitrobenzene	0.57				0.0013	2		ppd
2-Nitrophenol	0.73				0.0017	2		ppd
4-Nitrophenol	9.8	-			0.0224	2		ppd
2,4-Dinitrophenol								
4,6-Dinitro-o-cresol	4.9				0.0112	2		ppd
N-nitrosodimethylamine								
N-nitrosodiphenylamine								
N-nitrosodi-n-propylamine								
Pentachlorophenol				-				
Phenol								
Bis(2-ethylhexyl)phthalate	1.6				0.0036	2		ppd
Butyl benzyl phthalate								
Di-n-butyl phthalate	0.87				0.0020	2		ppd
Di-n-octyl phthalate								

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Pollutant	Detection Level Used	Maximum Daily Value	Maximum Daily Value	Average of Analyses	Average of Analyses	Number of Analyses	Units	Units
		Conc.	Mass	Conc.	Mass		Conc.	Mass
Diethyl phthalate	0.85	· · · · · · · · · · · · · · · · · · ·			0.0019	2		ppd
Dimethyl phthalate	0.96				0.0022	2		ppd
Benzo(a)anthracene							_	
Benzo(a)pyrene								
3,4-Benzofluoranthene								
Benzo(k)fluoranthane								
Chrysene								
Acenaphthylene								
Anthracene	0.72				0.0016	2		ppd
Benzo(ghi)perylene								
Fluorene	0.92				0.0021	2		ppd
Phenanthrene	0.80				0.0018	2		ppd
Dibenzo(a,h)anthracene								
Ideno(1,2,3-cd)pyrene								
Pyrene	0.63				0.0014	2		ppd
Tetrachloroethylene	0.50				0.0012	2		ppd
Toluene	0.10				0.0030	2		ppd
Trichloroethylene	0.50				0.0012	2		ppd
Vinyl Chloride	0.18				0.0004	2		ppd
Aldrin				<del></del>				
Dieldrin								
Chlordane								
4,4'-DDT								1
4,4'-DDE								
4,4'-DDD								
alpha-endosulfan								
Beta-endosulfan								_
Endosulfan sulfate								
Endrin				, <del></del>	<u> </u>			
Endrin aldehyde								
Heptachlor	†							<del>                                     </del>
Heptachloro epoxide					1			
Alpha-BHC								
Beta-BHC				-				<del>                                     </del>
Gamma-BHC	<del>                                     </del>							+
Delta-BHC	<del>                                     </del>							
DOME-DITO					<u> </u>	L <u>_,</u>		

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Pollutant	Detection Level Used	Maximum Daily Value	Maximum Daily Value	Average of Analyses	Average of Analyses	Number of Analyses	Units	Units
		Conc.	Mass	Conc.	Mass		Conc.	Mass
PCB-1242								
PCB-1254								
PCB-1221					ļ. <u> </u>			
PCB-1232								
PCB-1248								
PCB-1260								
PCB-1016								
Toxaphene								
2,3,7,8-TCDD								
Asbestos								
рH								
Biochemical Oxygen								
Demand (5-day)					<u> </u>			
Chemical Oxygen Demand								
Chlorides, Total								
Chlorine, Total Residual								
Flouride								
Magnesium, Total								
Ammonia (as N)								
Oil and Grease								
Total Suspended Solids								
Total Organic Carbon								
Kjeldahl N								
Nitrate + Nitrite (as N)							,	<u> </u>
Total Organic N								
Phosphorous (as P)								
Sulfate (SO <sub>4</sub> )								
Sulfide(S)							·	
Sulfite (SO <sub>3</sub> )								
Temperature (Winter)								7.7
Temperature (Summer)				···	<del></del>			
Color, ADMI								

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Pollutant	Detection Level Used	Maximum Daily Value	Maximum Daily Value	Average of Analyses	Average of Analyses	Number of Analyses	Units	Units
		Conc.	Mass	Conc.	Mass		Conc.	Mass
Antimony, Total								
Arsenic, Total								
Barium, Total								
Beryllium, Total								
Cadmium, Total								
Chromium, Total								
Copper, Total								
Cyanide, Total	0.0025 mg/L				0	2		ppd
Lead, Total	3.4				0.0079	2		ppd
Mercury, Total								
Nickel, Total								
Selenium, Total								
Silver, Total								
Thallium, Total								
Zinc, Total	6.5				0.0465	2		ppd

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